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North Atlantic Regional Water Resources Study

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John H./Spencer, Ervin H./Zube
Carl/Carlozzi

Appendix N

Visual and Cultural Environment

The North Atlantic Regional Water Resources (NAR) Study examined a wide variety of water and related land resources, needs and devices in formulating a broad, coordinated program to guide future resource development and management in the North Atlantic Region. The Study was authorized by the 1965 Water Resources Planning Act (PL 89-80) and the 1965 Flood Control Act (PL 89-298), and carried out under guidelines set by the Water Resources Council.

The recommended program and alternatives developed for the North Atlantic Region were prepared under the direction of the NAR Study Coordinating Committee, a partnership of resource planners representing some 25 Federal, regional and State agencies. The NAR Study Report presents this program and the alternatives as a framework for future action based on a planning period running through 2020, with bench mark planning years of 1980 and 2000.

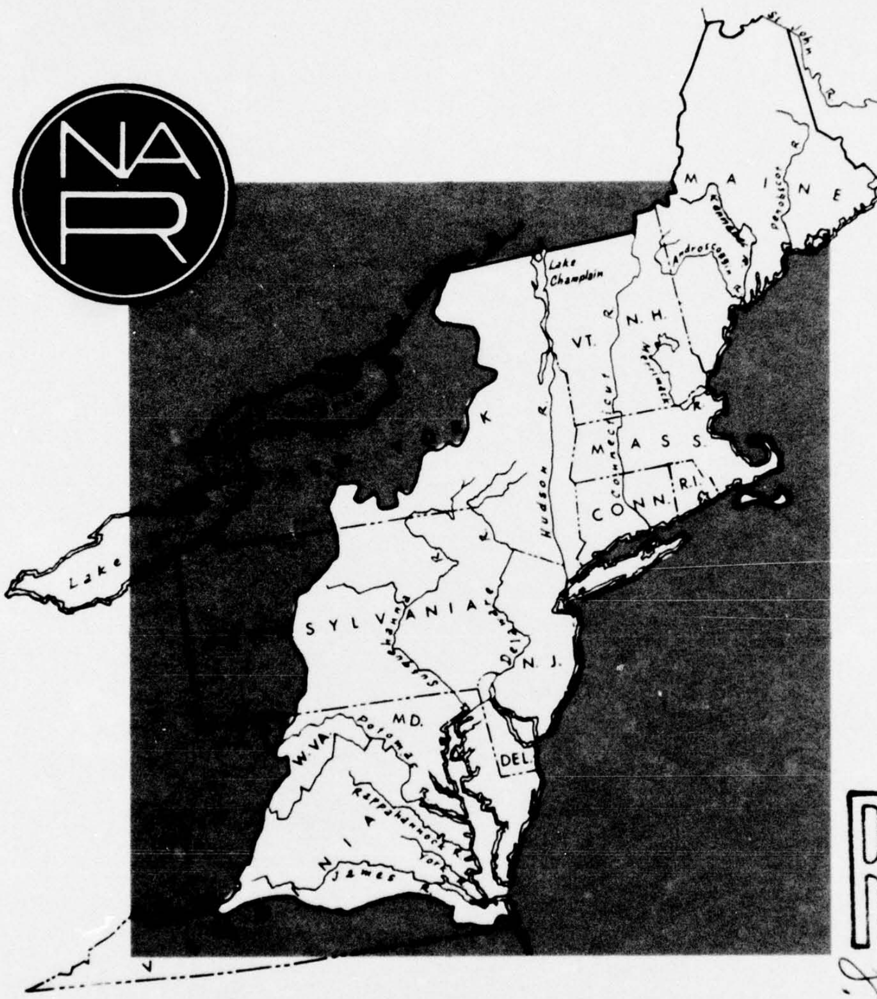
The planning partners focused on three major objectives -- National Income, Regional Development and Environmental Quality -- in developing and documenting the information which decision-makers will need for managing water and related land resources in the interest of the people of the North Atlantic Region.

In addition to the NAR Study Main Report and Annexes, there are the following 22 Appendices:

A. History of Study
B. Economic Base
C. Climate, Meteorology and Hydrology
D. Geology and Ground Water
E. Flood Damage Reduction and Water Management for Major Rivers and Coastal Areas
F. Upstream Flood Prevention and Water Management
G. Land Use and Management
H. Minerals
I. Irrigation
J. Land Drainage
K. Navigation
L. Water Quality and Pollution
M. Outdoor Recreation
N. Visual and Cultural Environment
O. Fish and Wildlife
P. Power
Q. Erosion and Sedimentation
R. Water Supply
S. Legal and Institutional Environment
T. Plan Formulation
U. Coastal and Estuarine Areas
V. Health Aspects

WATER RESOURCES NEEDS AND POTENTIALS FOR AN EXPANDING SOCIETY

Appendix N
Visual and Cultural Environment



Prepared by

Research Planning and Design Associates, Inc.,
Amherst, Massachusetts

for the

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY
COORDINATING COMMITTEE

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ACKNOWLEDGEMENTS

This report is the product of a team effort, a team consisting of the principals of Research Planning and Design Associates, Inc. of Amherst, Massachusetts. Each aspect of the work has been influenced to some degree by each of the principals. Most of the principals however, have also had specific responsibility for individual sections. They were as follows:

Inventory and Evaluation: Julius Gy Fabos, Paul N. Procopio, John H. Spencer and Ervin H. Zube
Ecological considerations: Carl Carlozzi
Visual and Cultural Needs: Walt Cudnohufsky, Julius Gy Fabos and Ervin H. Zube
Plan Formulation Representative: Terrence J. Boyle
Water Management Devices: Walt Cudnohufsky and Paul N. Procopio

The manuscript for this report was prepared by Ervin H. Zube who also served as project manager for the study.

Consultants to Research Planning and Design Associates Inc. on various phases of the study were Dr. Hugh Davis - cultural values, John Martin - graphics, The Conservation Law Foundation - legal devices, Dr. Jean Wyckoff - land economics and Dr. Hubert Vogelman - ecology. Numerous individuals in state and federal agencies and in private institutions also contributed generously of their time in responding to our letters of inquiry and in granting interviews. Grateful acknowledgement is made of these contributions.

A final note of acknowledgement is extended to the National Park Service with whom and for whom we worked on this study. The ready assistance offered and their confidence shown in our participation in the North Atlantic Water Resources Plan is truly appreciated.

SECTION I: PURPOSE AND SCOPE

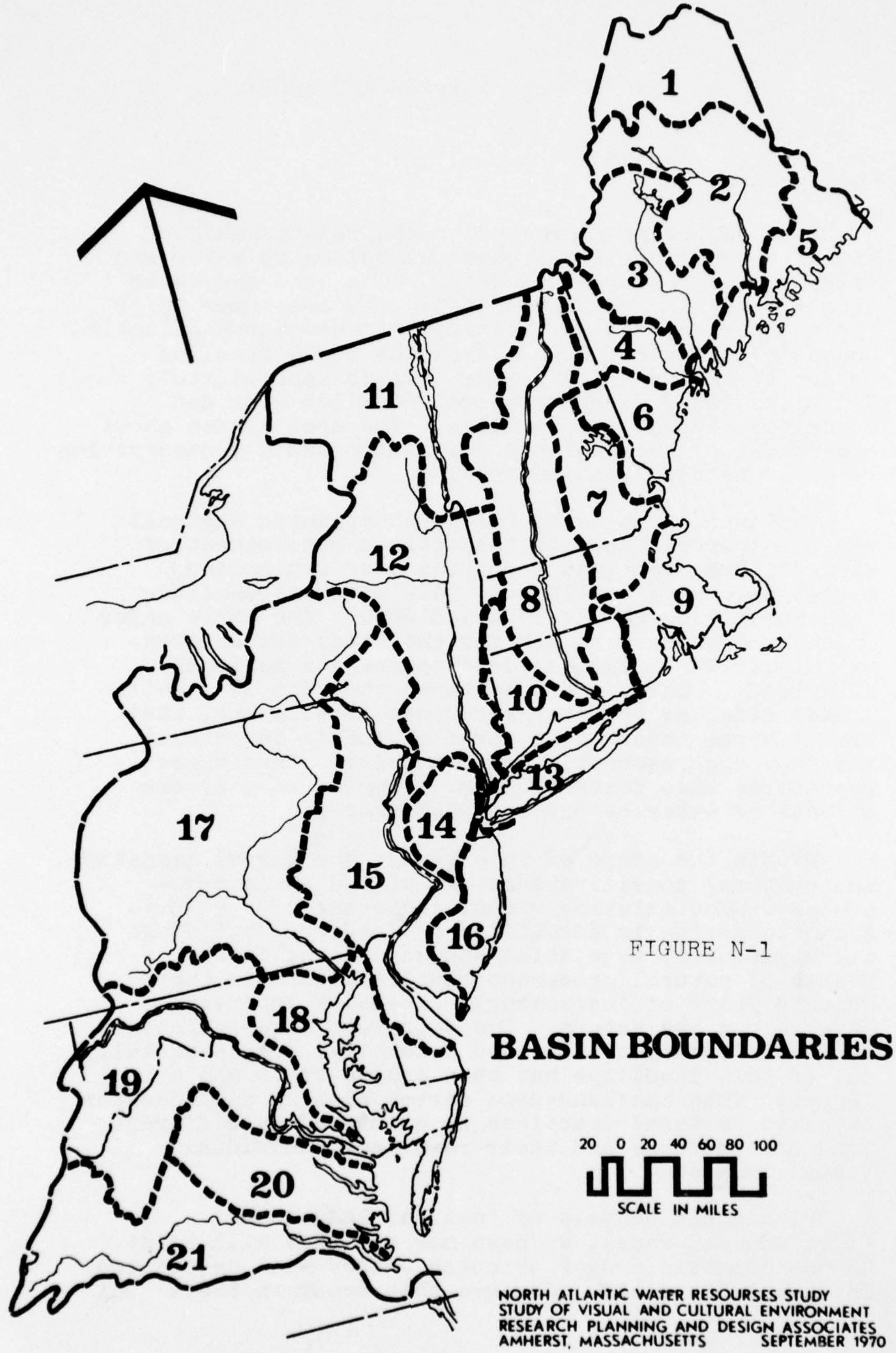
INTRODUCTION

This report is addressed to the relationship of visual and cultural environmental values to water and related land resources planning. The land and water area is the North Atlantic Region, an area made up of the major river basins draining into the North Atlantic Ocean. The region extends from the North Carolina border to the Canadian border. It is approximately 900 miles long, averages about 200 miles wide and comprises 167,000 square miles. The area houses about one-fourth of the Nation's population and a concentration of major metropolitan centers.

The overall focus of the North Atlantic Regional Water Resources Study is the optimum development of water and related land resources over a planning period extending to the year 2020 with intermediate benchmark years set at 1980 and 2000. The three major objectives which were set for the study are environmental quality, regional development and national efficiency. These are objectives that can be significantly affected by water resources development, they are of broad interest in terms of public investment and they are reasonably comprehensive. Thus these objectives also foster consideration of most of the effects of water resource investment.

Within the scope of this study, the visual landscape and cultural considerations are viewed as interdependent. The existing visual landscape of the North Atlantic Region is identified by landform, buildings and structures, vegetation and water, and is the result of natural processes coupled with over three hundred years of increasingly intensive interaction between man and nature. The degree of interaction has varied in location, time and intensity, but essentially all of this landscape has been subjected to man's impact. Thus the landscape serves also as an indicator of basic cultural practices as evidenced by different land use patterns and their resultant individual visual images.

Within the context of "natural landscapes" (i.e. non man-made), we have now all that will exist. No new mountain ranges or ocean shores will be created. The supply is fixed. Changes that occur in the visual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SCALE IN MILES
NORTH ATLANTIC WATER RESOURSES STUDY
STUDY OF VISUAL AND CULTURAL ENVIRONMENT
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AMHERST, MASSACHUSETTS SEPTEMBER 1970

FIGURE N-1

landscape within the next fifty years will be a product of man's use, management or mismanagement of the land.

The objectives which were developed for the "Study of the Visual and Cultural Environment of the North Atlantic Region" were; to identify the quantity and quality of visual and cultural environmental or resource values, to relate the resources and values to a locational or geographic context, to assess the needs within the region for quality visual and cultural resources, and to relate the needs and the available resources to the planning objectives and the planning time period set for the study.

APPROACH

The approach developed for this study consists of four steps. First is the development of a landscape inventory technique that includes the total landscape and not just special features or sections such as river valleys or shorelines. The technique which was developed was based upon visual indicators and used a minimum of relatively easily obtained data. Visual indicators represent both the natural components such as hills or mountains and man-made components such as towns and farms. The technique also accomodates the addition of more detailed data as the planning process narrows down to more precisely defined units of land.

The second step is the identification of visual and cultural qualities in the landscape, taking into account both the natural and the man-made components. Visual qualities are related to the image or the perceived landscapes, the degree to which visual satisfaction and stimulation is maximized, and to scarce or unique landscape resources. Cultural qualities are related to opportunities for man's use and to the relationship of the landscape to life style and amenities as well as to cultural artifacts in the landscape. These qualities, to the extent possible within the present state of the art, are then ranked or evaluated on a relative quality scale of high, medial and low.

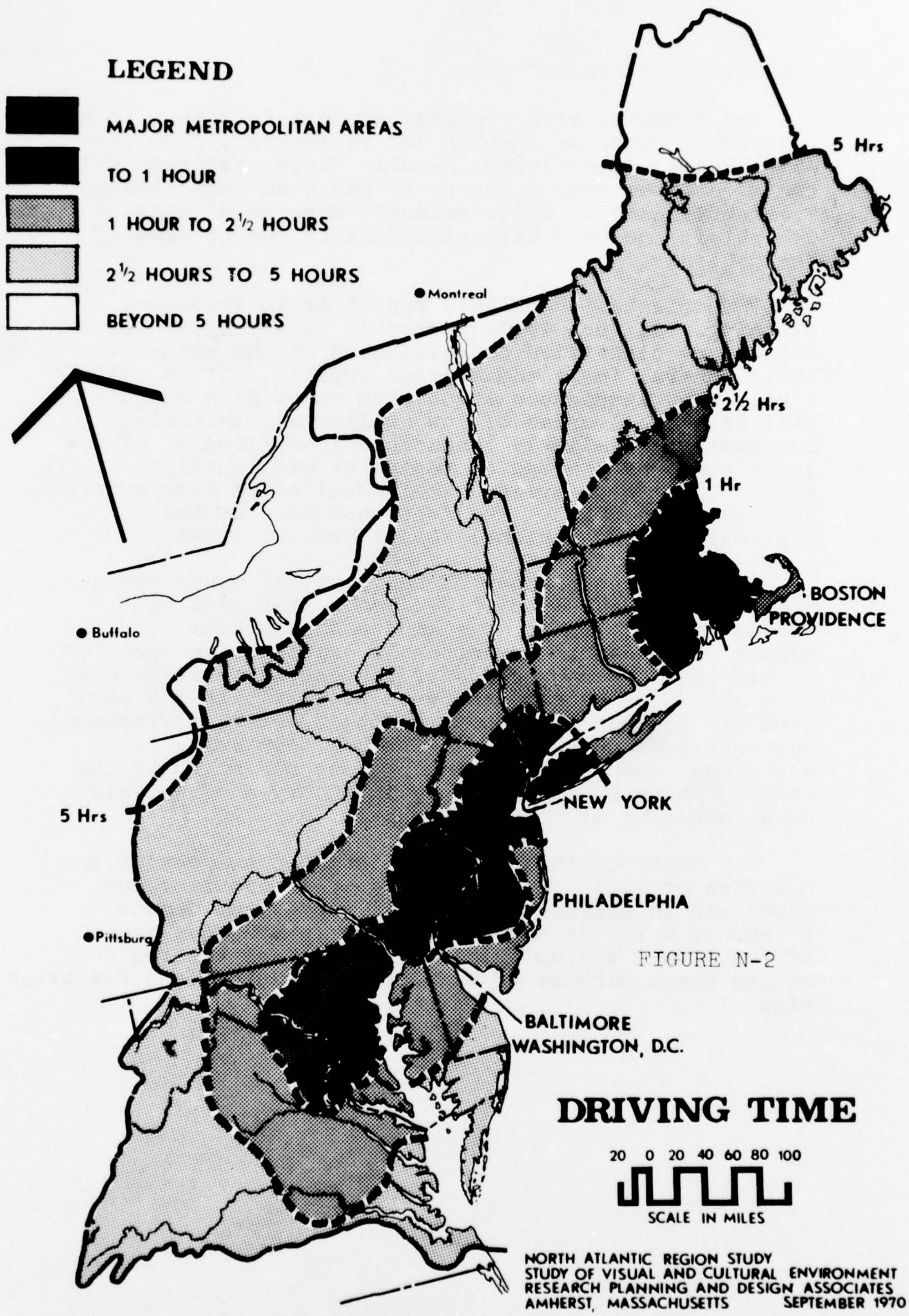
The third step is the definition of needs and the assessment of a general order of magnitude for visual and cultural needs. These are only needs that relate to water and related land resources. They are needs that can be influenced, at least partially, by the planning and management of these resources. The assessment of the general order of magnitude

is based on considerations of population concentrations, the accessibility of population concentrations to quality environments and to environmental amenities and the relative abundance or scarcity of quality landscapes.

The fourth step in the approach developed for the study is addressed to the bridging of the gaps between the need, the resources, the planning objectives and the planning time period. The gap between the needs and the resources is bridged by devices. Devices are those things which change or manage a resource such as reservoirs, flood walls and wells or those things which affect the demand so that existing resources are sufficient such as zoning or other resource use controls and legislation. Devices are used to manage the resources so as to satisfy specified needs. Not all devices are equally suitable for satisfying all needs. Devices are identified which are most beneficial in support of visual and cultural values. Other devices are reviewed in terms of their potential visual, cultural and ecological impact.

The gap between the needs and resources and the planning objectives is bridged by the selection of specific devices for different objectives on the basis of the overall effectiveness and the cost of the device. The most effective devices yielding the most permanent, long-lasting management and the greatest investment are those which are directed towards the satisfaction of the environmental quality objective whether this satisfaction concerns development that invites growth or maintenance of the status quo.

And finally, the gap between the needs, resources and objectives and the planning time period is bridged by the setting of priorities. Highest priority with emphasis on the 1980 benchmark year, is given to the needs and resources attendant to the population concentrations in the major metropolitan areas and to scarce quality landscape resources. In the case of the latter, failure to deal with scarce and unique resources in the immediate future may well mean that the opportunity will not exist in the intermediate or distance future because the resource value will have been diminished or eliminated by conflicting use. A time-distance dimension based upon driving time from the major metropolitan areas with the NAR is used as an indicator of priority for the needs related to population concentration. In general, needs identified within the one hour time zone take precedence over those within the two and one-half hour zone. Priority is given to those needs in closest proximity to population concentrations.


LEGEND
MAJOR METROPOLITAN AREAS
TO 1 HOUR
1 HOUR TO 2½ HOURS
2½ HOURS TO 5 HOURS
BEYOND 5 HOURS
Montreal
Buffalo
Pittsburg
5 Hrs
2½ Hrs
1 Hr
5 Hrs
BOSTON
PROVIDENCE
NEW YORK
PHILADELPHIA
BALTIMORE
WASHINGTON, D.C.
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NORTH ATLANTIC REGION STUDY
STUDY OF VISUAL AND CULTURAL ENVIRONMENT
RESEARCH PLANNING AND DESIGN ASSOCIATES
AMHERST, MASSACHUSETTS SEPTEMBER 1970

FIGURE N-2

POTENTIAL AND LIMITATIONS

The point of view represented in this report is also related to planning in-puts for recreation, fish and wildlife and agricultural needs. These are needs which are more often complimentary rather than conflicting. Frequently land or water resource demands delineated to satisfy one need will also satisfy one or more of the others.

The orientation of this report is to framework planning. As such it is addressed to averages. Landscapes are classified and evaluated on the basis of their general image and average quality. It is quite likely that landscapes identified as of high quality will have small areas of low quality within their boundaries. Similarly landscapes identified as of low quality may have areas of medial or high quality within their boundaries. Individual sites have generally not been considered. The focus has been on the regional and sub-regional scale, not the local.

The potential impact of the physical water management devices discussed in Section V must also be viewed in this light. The kind and magnitude of impact discussed is the probable impact to be expected within the different kinds of landscapes. Differences also are to be expected between sites within the same kind of landscape. These are not, however, differences that can or should be coped with at this scale of planning. When the planning process has moved to the scale of site considerations, inventory and analysis data should be of comparable scale.

The scale of this study is intended to provide an overview of regional and sub-regional resources and needs and an assessment of their supply and demand. It should serve as a guide for the future development of the visual and cultural environment of the region within the construct of a water and related land resources plan.

SECTION II: CONCEPT AND METHODOLOGY

INTRODUCTION

This section sets forth the general concept underlying this study and presents a discussion of the method used in its execution. It is divided into six parts: Cultural Values, Landscape Analysis, Visual and Cultural Needs, Landscape Planning and Management, NAR Planning Framework and Water Management Devices. In part it parallels Sections III, IV and V which deal in detail with the landscape analysis, visual and cultural needs and water management devices respectively.

CULTURAL VALUES

The cultural factors considered in this study are those that are directly related to the landscape and are frequently identified with life styles and amenities. More specifically, they are factors related to: where people live, work and play, how they move from one place to another and what kinds of landscapes contribute to quality in the environment.

There are two reasons for exercising caution in considering this aspect of the study. First, the kind of water and land resource policies put into effect during the next ten to twenty years will both dictate and reflect some of the life styles in the Region's future. Planning is not unlike the judicial process in this sense. Court decisions often both reflect and add impetus to evolving cultural values; landmark decisions of the courts may well determine future cultural values by giving legal sanction and direction to some aspects of the social process. In parallel fashion, the planning process also reflects present conditions, and it too becomes involved with more than maintaining the status quo. It is centered more on what should be done than on coordinating and organizing existing circumstances. Thus it becomes part of the cultural evolutionary process and is a conditioner of cultural values. Hence prognostication of what future values will be held in the NAR will in part be determined by the resource plans that are effectuated over the next decade or so. This is especially true in the case of water, the most basic of all natural resources. Any

marked and sustained changes in the Region's water quality or total deliverable supply will bring an equally marked change to the economy of the area and hence to the way people live in the Region.

The second reason for caution stems from the nature of the subject and the fifty year length of the planning period. The determination of values for a generation whose parents have not yet been born is as difficult an assignment as it is dangerous. It is as if one were predicting in 1920 the cultural values of today. Who could have foreseen the effects of another world war, a major economic depression, a New Deal, atomic power, installment buying and a Federal income tax? In the next fifty years certainly many of our cultural values will differ from what they are today; some current values will be held more strongly, others will be dropped. To be highly specific would be little short of nonsense. The approach taken here is to point out those factors within contemporary society that should be watched carefully throughout a continually changing and adjusting regional water resource development plan.

The term "cultural values" as used here refers to how people live or to their life style. The concern is to indicate how these patterns of living may cause significance to be attached to the visual landscape and why this may be so.

The overall objective of this aspect of the report is to serve as a guide to water resource planning. It will do this by calling attention to those cultural values which appear to warrant special attention by the resource planners through the next fifty years.

Population: The total number of people living in any region changes over time by only three processes; births, deaths and migration. In the United States, death rates, under normal conditions, will not change significantly over the next fifty years. They will be relatively easy to predict. Changes in birth rates are more difficult to predict and can change more rapidly than death rates. Shifts in cultural values regarding sex, size of family, parental responsibilities and abortions can all change and cause a considerable change in birth rates over a short period of time. Careful attention should be paid to these factors operating in the society.

By far the most important reason for population change within any region is migration. This is the most difficult to predict and can change its directions rapidly and bring about the most sudden and significant differences in both the number of people, their distribution and the age composition of the population. Further, because of the age-selectivity of migration it is a major causal factor in shifts of regional birth and death rates. The smaller the planning area, the more tenuous are population projections because of the migration factor.

The NAR is large enough so that it is safe, given present knowledge, to assume the majority of migration will be within the Region. To the extent this is true the significant effect of migration will not be total numbers but age composition within sub-regions and the distribution of people within the whole region. For example, continued concentrations of people in urban areas is almost assured. However the age structure of the urban population can have an influence on the kinds of visual landscapes people will value highly. A population having a high proportion of its numbers in older age groups may place greater importance on a bucolic landscape than if the age distribution were weighted in favor of younger persons.

One final point needs to be made regarding migration. The recognized great physical mobility of the Nation's population should, for purposes of this report be viewed in two ways. One is the more or less permanent type of movement when a family leaves the farm, for example, and seeks a new livelihood in the city. The second is a temporary kind of migration from one location in the region to another and back again. This sort of movement is done by those people living in two places during the year. It is likely to be one of the most important factors functioning in the region in the years ahead.

<u>The Seasonal Home-owner:</u> The trend toward the urbanite owning a "cottage up at the lake" is growing extremely rapidly in almost all sections of the NAR. It is being fostered by both the building and real estate industries. As yet very little is known about why people are motivated to buy a second home, but it is extremely clear that they are. Very special and extensive attention needs to be given to this emerging

aspect of our culture. It is highly probable that people buying seasonal homes in rural areas will place special importance on the quality of the visual landscape in which they settle. In terms of the resource planner this rapidly expanding use of the rural landscape has the effect of adding additional people to the regional population even though the individuals involved have not moved in or out of the NAR. For, in essence, they are placing a double requirement on the service resources. In the case of domestic water supply and waste disposal, for example, the capacity to meet the needs of a family of five living part of the year in Hartford, Connecticut and part of the year in the White Mountains must be provided in both places. Thus rather than amounting to five people in the regional population they are more nearly equal to ten in terms of their demands on the resource capacity. What the overall long run effect of these second home (and land) owners will have on the resource management is still difficult to determine. However, it is clear that this trend is providing a profitable use of abandoned and non-economical farms and that the second home owners will no longer feel the need to use public recreation areas for certain kinds of outdoor activities. For the water resource planner it is difficult to overemphasize the potential implications of this trend towards living in both an urban and rural setting.

Urbanization and Transportation: All indications are that urbanization will continue and that during the next half century more and more people will be living in urban areas. This is likely to hold true both in terms of actual numbers and in percentages of the total regional population. As the cities grow in population density it will be necessary for the society to exert more and more control over patterns of living. The trend will be towards homogeneity in the way people live. For example, mass transportation, bringing with it a certain loss in the individual's choice of movement is on the way back and could surpass its former heyday of riverboat and railroad. The hydrofoil is already functioning well in Britain and one hundred and sixty mile an hour trains are proving successful in Japan.

Whatever new forms mass transportation may take in the NAR, their paths must roughly approximate the present major transportation corridors along the Eastern Seaboard. The dollar costs of constructing and operating these new systems now in the early planning

and development stages, dictate that they function between high population concentrations. The new mass transit systems will add impetus to the concentration of people into urban centers.

It is difficult to determine how much of the Region's future population will use these new forms for moving large numbers of people at high speed. Current estimates of air travel point out that only a little more than ten percent of the Nation's population has ever made a commercial flight in spite of the enormous numbers of passenger miles flown annually. Thus the significance of the coming transit systems is not so much the percent of the population using them, or the passenger miles traveled, but their magnetic power in drawing and holding large concentrations of people close to their terminal and intermediate stopping points.

These points of access to the major forms of transportation will, as has been true with the interchanges along the Nation's highway network, become new centers or at least expanded centers of activity. They will need close attention by the resource planners. They may well be quite different from the bedroom commuter community of the past few decades. New urban growth around Valley Forge alongside the Pennsylvania Turnpike indicates that people may not live in these new centers. Because of high land values, it is extremely unlikely that there will be privately owned homes close to these nodal transportation points. Apartment dwellings may develop, but it seems more probable that people will live several miles away and commute back and forth either along the new system itself or by conventional means from near-by communities.

The automobile will continue to be a major form of transportation as its efficiency for short runs and the freedom it permits the owner are not likely to be completely replaced in the forseeable future. Our present road network of almost one mile of road for every square mile of land is too extensive and represents too large an investment to be set aside as we did the horse and buggy. Nevertheless, it will be completely inadequate to handle what is currently projected for the future number of automobiles. While the economy scrapped about six million motor vehicles in 1967, this hardly made a dent on the over ninety million in operation that year. The 244

million vehicles predicted for the year 2000, under present conditions of auto and highway design, seem almost too much to contemplate. Clearly some changes will have to be made. The auto of the future will be of vastly different design than that of today. The electrically powered car now on the threshold of production is the forerunner of a new means of private mobility.

Preliminary results of the 1970 census of population indicate apparent growing preferences for suburban or dispersed living. It seems likely that this dispersed pattern of residential development will continue to be attractive to a substantial portion of the population in the future. While some people will be attracted to new super buildings in the rebuilt centers of super cities, the attraction of the single family suburban home will continue. Vast acreages of land will be consumed but, hopefully, the growing concern for a quality environment will also lend support to the concern for controlling growth patterns. Suburban developments would then follow the model of cluster subdivisions and planned unit developments, thus protecting important natural resources from exploitation and destruction.

It seems very possible that in the centers of the new super cities of tomorrow there will be comparatively few privately owned autos. There is growing public acceptance of the concept of super buildings where families will live, go to school, play, shop and work under one roof. These conditions will make the use of a small private vehicle unnecessary in the city.

Life in a super building may appear as unrealistic and undesirable. Yet in fact it is not vastly different, and certainly more efficient than the way of life of many large city residents today. Several studies have found that a sizeable portion of these people seldom venture outside a ten block area for years at a time. The meaning of a high quality natural landscape to these inhabitants has yet to be determined.

This may not be the case for the super building resident of the future. While still lacking solid scientific documentation, there is evidence that for most individuals, environmental change is both desirable and desired. The super building dweller may

spend his work week in the building, then on the week-end travel several hundreds of miles in an underground tube, rent a "car" and drive another fifty or hundred miles to his home in the country. To this man the changes provided by a different environment will be extremely important. The fact that he owns this second home will also be highly important to him psychologically.

Private ownership is a cultural value not likely to be set aside in the predictable future. It carries with it a sense of individuality and freedom of choice which will not be as prevalent in the super building. As personal freedoms in the city become more and more limited, the desire to reestablish one's individuality is likely to become stronger. From the standpoint of developing or maintaining a desirable quality of the visual landscape, no single cultural value appears to be more impelling than the right of the individual to feel that he is an individual and can do as he wishes with his home and his land.

It is impossible to say what values future generations will place on different facets of the landscape. For those few people who will remain in rural areas all their lives, the values may change little from those held today. But the vast majority, perhaps as high as eighty-five percent may truly be culturally removed from the rural landscape. For those who do not own a home outside of the urban area, a trip to the hinterlands may take on many of the same aspects as a trip to the local art museum. Many of these people will be four and five generations away from any real familiarity with the land. It is probable that they will find it rather strange. The important thing will be a change from the urban setting rather than the specific elements comprising the landscape. Variety will be more significant and the more unique it is the more important it will become.

There is however, one component of the natural landscape that is a possible exception to this. Water for all of history has held an attraction for man. There is no reason to suppose that this will change over the next fifty years. Water is the most important aspect of the visual landscape. Forests, fields, valleys and mountains are major elements, but bodies of water add a positive exponential factor to their visual quality. Except in the case of badly polluted rivers, it is almost never out of place in the landscape.

A Point of View: What do people see when they look at a landscape? What individual factors are important in determining perception? These are subjects about which very little is known, and the need for research on these topics is apparent at every turn. However, speed of travel is obviously a factor, as is elevation. The super-sonic jet traveller views things very differently than does the person on a bicycle. But those elements of the visual landscape people deem important will also vary with education and degree of familiarity with the landscape. Interest in what one looks at however, may be greatest if the subject is completely new. The first time one flies, the landscape below is quite fascinating. New patterns appear that one was not aware of before. All sorts of changes seem to take place in its appearance.

The visual landscape seems to hold more appeal for people when it is seen from an elevated point, whether this is from an airplane or a ridge top. Even today the cost of renting an apartment on the thirty-fifth floor is more than on the fifteenth --- largely because of the view provided by the additional height. Throughout the NAR it seems very possible that people will attach special values to ridge tops because of the views they provide.

Trends point to more and more people obtaining a college education. This will continue for some time. Yet the amount of education that one receives may not be as significant in terms of appreciation and style of living as the kind of education. An obvious difference can be illustrated by comparing the artist with a bachelor's degree and the chemical engineer with a doctoral degree. Years of college by themselves will not necessarily be an indicator of the population's appreciation of visual quality. The recent interest across the nation in natural beauty has not originated in the academic world but from the Federal Government. This new concern for a quality environment is wide-spread and well established. It is now a factor which must be considered by all resource planners. The kind of legislation passed at all three levels of government makes almost certain that this demand for an attractive landscape will grow in strength as a cultural value.

Coupled with this new and still only partially understood interest in visual quality is an almost equally strong interest in the Nation's historic past. The scale of the report does not permit treatment of sites of local importance, but the planner is well-advised

to respect the integrity of old landmarks and neighborhoods. Many court battles have already been fought to save some locally significant site. The public is developing such concern over these local historic sites that the time may not be far off when the courts will demand a far stronger case to be made for the necessity of destroying these sites. Long before the year 2020 the same may be true for an outstanding tree or a particularly pleasing landscape. In many communities throughout the region protection of open space has almost reached this status.

The Role of Governments: During the next fifty years the anticipated squeeze between an increasing population and a fixed natural resource base will require more and better planning One effect of this can already be seen in the public acceptance of inter-governmental planning bodies. More wide-spread adoption of rural zoning can also be anticipated, as well as the growth in number and effectiveness of nongovernmental citizen planning groups. Many of these will have as their sole objective the preservation of open space and the maintenance or establishment of some sort of environmental quality.

Summary: In summary, this discussion has focused on the most important aspects of the social and cultural climate of the NAR affecting the visual quality of the landscape. It goes beyond this and in general terms attempts to indicate why certain life styles will develop and how these may relate to the importance people will place on the landscape.

It is pointed out that for the NAR as a whole there will be an increase in its population. Migration and other factors will continue to cause an increase in the size of present centers of population. The present uneven distribution of people within the region and its sub-regions will be accentuated even more during the decades ahead. There will be a continuation in the gradual loss of individual freedom of choice.

New patterns of living will develop in rural areas of the region. Second homes will be the single most important change in living style to develop in the forseeable future. The number of people owning a second home, (or just land) in a rural area is increasing each year.

New modes of transportation will have the effect of concentrating more people along their routes, and especially at the intermediate stopping places. Entire

new cities will grow at many of these mass transportation nodes. The super building where all the normal daily activities of a family can take place under a single roof may become a new way of life for many urbanites.

Far more importance will be placed on the appearance of the landscape and historical sites. Preservation of the rural landscape in a sort of status quo situation will be more important to more people than it is today. The affluent urban dweller will own substantial amounts of land in the rural areas.

Water will increase in importance as a major factor of the visual landscape. Those features of the landscape that are most unique are likely to become of major concern to the public.

Finally, some of the effects of resource planning itself will determine and support the evolving cultural values over the next fifty years.

LANDSCAPE ANALYSIS

Inventory: The regional landscape is conceptualized as composed of two major, superimposed systems, the so-called natural and the man-made or the man-manipulated. Most often the elements of topography, vegetation and water are associated with the visual image of the natural landscape. Of these, topography or landform is assumed to be the most dominant and the most enduring. This is the most nearly permanent component of the landscape and constitutes, basically, a fixed supply of both land area and landform. It is highly unlikely that any new mountain ranges or expanses of rolling hills will be created in the forseeable future. In dealing with planning problems for the next twenty or fifty years, diastrophic erosive and depositional processes will have little impact on the visual character of regional landforms.

Superimposed upon this natural system is the visual manifestation of the presence or absence of man. Man appears to alter the landscape in two basic ways; through the manipulation of the natural resources in such activities as farming, (cropland, pasture, orchards), mineral extraction and forest management (grid pattern planting and harvesting) and through the introduction of structures (buildings, roads, etc.). This man-made or man-manipulated landscape is one which is more

susceptible to change than the landform component of the natural system. Within the man-manipulated system one can identify patterns which have a dominant image that is created as a result of the kind and extent of man's manipulation. These patterns constitute a spectrum which ranges from that landscape which appears to be completely man-made to that which is apparently untouched by man. It includes landscape patterns which generate images of cities, towns, farms, forests and/or combinations thereof.

The major pattern generating elements at the regional scale are open land, (agricultural fields, pastures, wetlands, etc.), closed land (forests and wood-lots) and man-made structures. The apparent presence or absence of each, their dominance in terms of percent of area covered and their distribution throughout the landscape are the primary determinants of the pattern image.

The landscape inventory is based upon a system that identifies and classifies both the landform and the landscape pattern; the distribution of man-made structures, man-manipulated resources and natural land cover. The former, landform, is classified under Landscape Series and the latter, landscape pattern, is classified under Landscape Units.

Landscape Series are divisions of the landscape which are identified by the general visual impression gained from the repetition of a dominant landform over a large area. They consist of Mountain, Steep Hill, Rolling Hill, Undulating Land, Flat Land, and Coastline classifications. A seventh, the Compound Series encompasses those landscapes which are a product of two Series such as parts of the Appalachian Range which alternates between Steep Hills and Rolling Hills.

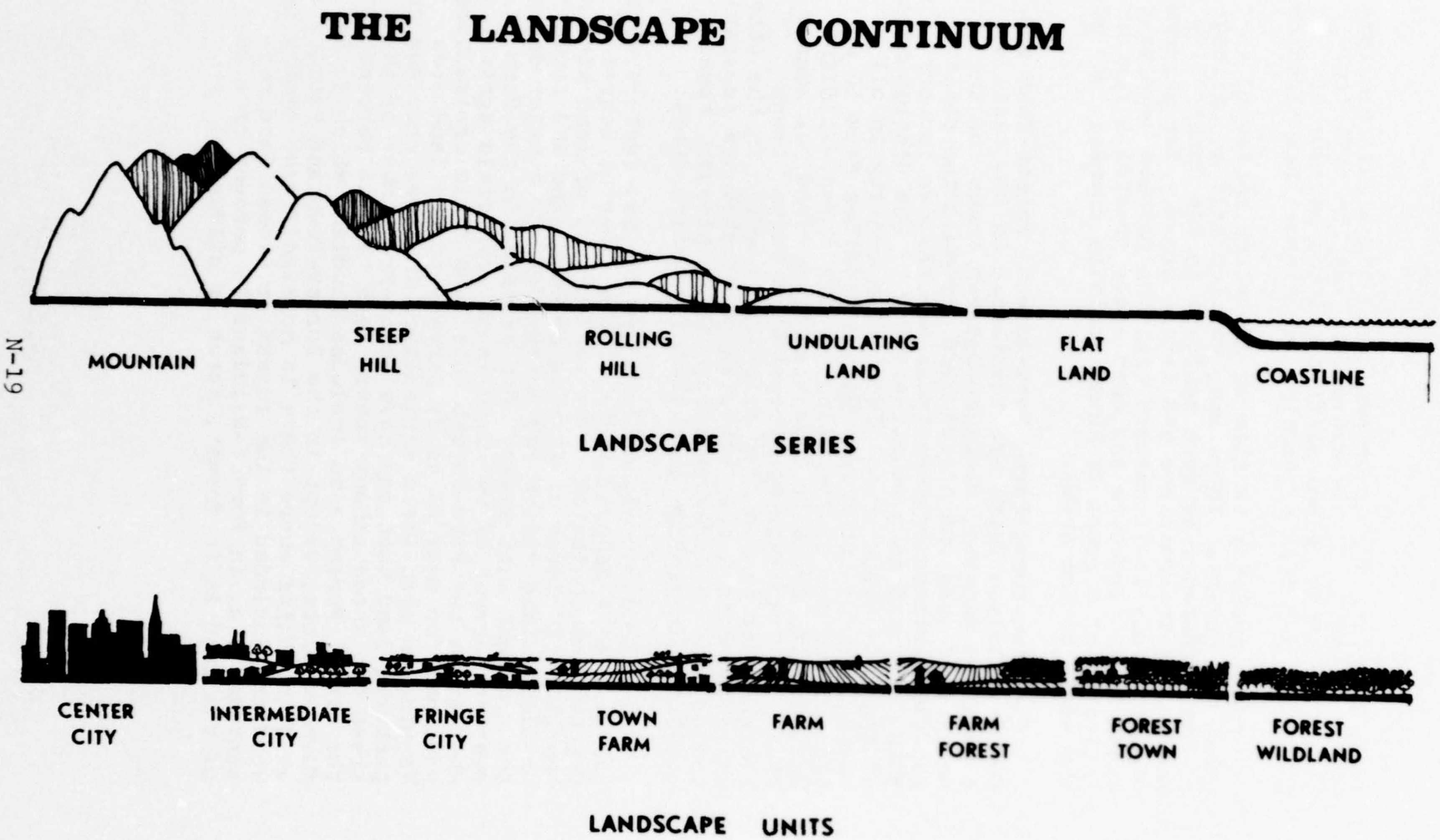
Series are frequently but not always coincidental with established geomorphological classifications. Landforms which are classified on the basis of their origin or their physical characteristics in youth or maturity (such as mountains) do not have the same visual characteristics in old age. For example, the southern end of the Green Mountains in Vermont and Massachusetts really look like hills and do not fit the definition established for the Mountain Series. Therefore, while geomorphological classification and/or mapping of landscapes may frequently be coincidental with the Series, they are by no means consistently so.

Landscape Series are further divided into Sub-Series which identify differences in form and facilitate the process of qualitative evaluation. These are differences in three-dimensional form and are generally a product of variations within a single landform component (e.g. long linear hill vs. short rounded hill, conical mountain vs. pyramidal mountain, linear coastline vs. irregular coastline, etc.) and/or variations in the distribution of the components (e.g. parallel rows of hills, scattered hills, clustered mountains, etc.). For example, within the Mountain Series the Adirondack Mountain Sub-Series is identified by densely clustered pyramidal peaks while the White Mountain Sub-Series is identified by conical peaks which are randomly distributed in rows of varying length. Similar distinctions which help to define the visual characteristics of the landscape can be identified and described within most of the Landscape Series.

Landscape Units are identified by consistent ground pattern - the two-dimensional distribution of man-made structures and man-manipulated resources on the landscape. If the landscape is envisioned as a continuum ranging from that which is completely man-made to that which is apparently untouched by man, Landscape Units represent cross-sections of that continuum. The cross-sections represent: Center City, Intermediate City, Fringe City, Town-Farm, Farm, Farm-Forest, Forest-Town and Forest-Wildland. These Units are not separated by definitive boundaries but rather by zones of transition. The names are indicative of the dominant visual image imparted by the landscape so classified.

The major pattern generating elements in the Center City, Intermediate City and Fringe City are structures, open space and vegetation. Structures are viewed in reference to their size, distribution and spacing and their generalized use such as commercial, industrial or residential. Open space as a pattern generating element includes streets, parks and undeveloped land and is considered in terms of both scale or size and distribution or location. The presence or absence of vegetation, primarily trees, is a very important element in both the identification of city patterns and in their qualitative evaluation. Units identified with these elements may also be further qualified by the presence of visual misfits - those factors which detract from the general visual image or impression. Misfits may be deteriorating structures,

FIGURE N-3


THE LANDSCAPE CONTINUUM
MOUNTAIN
STEEP HILL
ROLLING HILL
UNDULATING LAND
FLAT LAND
COASTLINE
LANDSCAPE SERIES
CENTER CITY
INTERMEDIATE CITY
FRINGE CITY
TOWN FARM
FARM
FARM FOREST
FOREST TOWN
FOREST WILDLAND
LANDSCAPE UNITS

badly placed roads or freeways and the visual manifestation of polluted air and water. Entire districts in cities often become misfits (slums) because of their age and lack of continuous internal regeneration.

Human activity is also an important aspect of the urban and suburban landscape, particularly as reflected in the difference between activity in the Center City and in the intermediate and fringe areas. For purposes of this study it is assumed that the pattern generating elements of structure and open space provide a reasonable indicator of degrees of human activity commensurate with the scale of the study.

The Town-Farm, Farm, Farm-Forest, Forest-Town and Forest-Wildland Units are identified on the basis of population density, distance between towns and the amounts of open and closed land. Population density and the distance between towns are the two factors which are used as a relative index of the distribution of man-made structures. Population density in all of these Units except Forest-Wildland varies from 50 to 500 persons per square mile. In the Forest-Wildland Unit density drops to less than 50 persons per square mile. In Town-Farm and Forest-Town Units, towns average from two to five miles apart while in the other units there is a much wider range of distance separating towns. In the Forest-Wildland Unit, however, towns consistently average more than five miles apart.

Open land and closed land are the two factors which are used as a general index of the apparent degree of resource manipulation. The percentages of land within the Units in terms of farming or open land and forest or closed land varies and determines, to a major degree the dominant Unit image. For example, in the Farm Unit over 50 percent of the land is in open field agriculture whereas in the Farm-Forest Unit open field agriculture accounts for only 20 to 35 percent of the land area. Farming or open field agriculture includes cropland and pasture; land that may have scattered timber or shade trees but whose canopy covers less than 10 percent of the area. Forest also includes woodland which is in farm woodlots, except in the Forest-Town and Forest-Wildland Units where there is no significant amount of woodland included in the forest or closed land percentage (e.g. in Forest-Wildland 75 percent or more of the land is in forest, scrub or wildland.)

Inventory Procedure: The preliminary classification of Series and Units was accomplished by interpretation of maps and population and land use data. Topographic maps (scale of 1: 250,000) were used to delineate general landform areas. Data available from reports of the U.S. Bureau of the Census were used for the initial delineation of general Unit boundaries.

Travel cross-sections of the NAR totaling over 10,000 miles were run on the ground and in the air. Initial field checks served to test the validity of the hypothesis; to identify the limitations of map and statistical data for visual classification and to see if there was a meaningful relationship between the map, the statistical data and actual visual recognition. Field checking also helped to refine the Series definitions and pointed up certain consistent dimensional characteristics in the Mountain and Steep Hill Series. Field checking or running cross-sections was equally important in developing the description of Landscape Sub-Series. The general identification of Sub-Series is possible using only map resources but an explanatory description of the visual characteristics requires actual inspection of the land-scape. Topographic maps show relative dimensions and distribution but are inadequate for assessing the visual character of landform profile and specific form characteristics such as angular, rounded, linear, jagged, etc. The landform analysis and description is most easily accomplished from the ground while pattern analysis and description is best done from the air.

The initial interpretation of the census data was directed at identifying differences within an individual Landscape Series. For example, these data indicated that within the Rolling Hills Series around Baltimore and Washington, D. C. there would probably be two different Units. To the north and northwest, more than 50 percent of the land is in open field agriculture. To the southwest only 20 to 35 percent of the land is in open field agriculture and 60 to 80 percent of the land is in forest and woodlots. In the former the dominant image is that of a farm landscape. In the latter the image is a composite one of farms and forests. Initially these areas were simply identified as two unspecified Units within the same Sub-Series. Similarly, Units were identified in each Series or Sub-Series without reference to Units in other Series or without reference to established pattern images. Subsequent field checks and the analysis of field notes pointed up however, the recurrence of generalized visual images

such as a farm landscape or a farm and forest landscape in widely separated parts of the NAR. Comparisons of the data for the areas identified as having similar images showed that there was a relationship between the separate Units in the percent of land area devoted to open field agriculture (cropland and pasture) and to forest and woodland (tree-covered lands in farms -- from the Census of Agriculture). There was also a general relationship in population density per square mile. Population distribution patterns were checked using maps and aerial survey data to determine the distance in miles between towns.

Landscape Evaluation: The landscape classification provides a means for obtaining a quantitative evaluation of different visual landscapes within the NAR. The relative abundance or scarcity of a given landscape can be assessed by areal measurement (or linear measurement for Coastline Series). Measurement can be limited to either Series, Sub-Series or Units or it can include composite evaluations such as the extent of a Farm-Forest Landscape Unit within a specific Rolling Hill Landscape Series. The quantitative evaluation can be related to the total region or to an individual river basin assessing the relative abundance or scarcity of each distinct landscape form and pattern.

Criteria were also established for a qualitative evaluation of Sub-Series and Units. They were of necessity based upon subjective evaluations. Sub-Series are analyzed on the basis of visual contrast and the diversity of spatial configuration created by the landform. It is assumed that both three-dimensional contrast (e.g. vertical mountain to horizontal valley) and spatial variety within the landscape are positive visual values. Spatial variety is judged on the basis of the shape of the spaces (simple or complex, linear or omni-directional),the degree of enclosure and the variety of shape and enclosure which exists. Each Sub-Series is analyzed in reference to every other Sub-Series within a given Series and assigned a value of high, medial or low. The procedure is followed for each Landscape Series in the region. The greater the degree of contrast and the greater the variety in spatial configuration, the higher the value.

Throughout most of the inland area of the NAR water is significant only as a site level feature. The visual impact of a water body is normally limited to its immediate environs. When 3 to 5 percent of

the surface area of a Unit is in water, however, and there is fairly uniform distribution of the water bodies, the image of the landscape becomes water-oriented (Penobscot County, Maine - 4.4%; Pike County, Pennsylvania - 3.1%). When the percentage increases to approximately 5 to 10 percent with uniform distribution, water emerges as a dominant pattern element (Kennebec County, Maine - 9.0%). Similarly, these percentages are also relevant to its significance as an element of contrast in the Series.

Landscape Units exclusive of the three city units were evaluated on the same three-level ranking of high, medial and low. The major criterion for the Unit evaluation was variety or diversity within the pattern. Variety in landscape pattern is a product of the scale and distribution of open land - crop fields and pastures, closed land - forest and woodlots, water surface - lakes, rivers and wetlands, and man-made structures - roads and buildings. The distribution of these elements on the land determines the richness or the monotony of the pattern. It is assumed that the more varied pattern has higher visual value and the same three-level evaluation of high, medial and low is used. For example, a Forest-Wildland Unit consisting of uninterrupted forest is rated low. A similar area of forest interspersed with lakes, marshes and rivers would be rated medial or high because of the greater diversity. The water surface not only contrasts with its surroundings as an element or material in the landscape but it also serves a function similar to that of open fields in creating pattern when it occurs in forest areas. Similarly a Farm-Forest Unit consisting of essentially uniform-sized blocks of pastures or hay fields alternating at regular intervals with forest areas or woodlots would not rate as high as a pattern that was created by varying sized blocks of farmland alternating at irregular intervals with varying sized forest areas or woodlots. The consistent presence of water would also influence the rating as it is not only an element of strong contrast within the landscape but it can also influence the two-dimensional pattern.

A numerical indicator of the combined landscape evaluation (Series - landform, Unit - pattern) is obtained by assigning numerical values to the high, medial and low evaluations (9, 6 and 3 respectively) and by assigning weighted values to Series or Sub-Series and Units. Weighting values are based on the hypothesis that "the more dominant the form (Series)

the less important the pattern (Unit) for high visual value." For example, pattern is not important for high value in mountains but it is very important in flat land. In the case of the latter, the pattern is the major variety or diversity generating element. Weighting values for Series and Units are:

Series	(SW) Series Weighting Value	(UW) Unit Weighting Value
MOUNTAINS	9	1
STEEP HILLS	7	3
ROLLING HILLS	5	5
UNDULATING LAND	3	7
FLAT LAND	1	9

The combined visual landscape value equals:

$$CLV = (SV \times SW) + (UV \times UW)$$

Where:

CLV = combined landscape value
SV = Series evaluation (high 9, medial 6, low 3)
SW = Series weighting value
UV = Unit evaluation (high 9, medial 6, low 3)
UW = Unit weighting value

Possible combined scores range from a low of thirty to a high of ninety. Combined evaluations are ranked as follows: a score of 70 to 90 is high; a score of 50 to 69 is medial and a score of 30 to 49 is low. Center City, Intermediate City and Fringe City Units were not evaluated. The Coastline Series is evaluated solely on the basis of the Series analysis.

VISUAL AND CULTURAL NEEDS

The visual and cultural needs which have been identified are those which relate to the interdependent nature of the visual landscape and cultural considerations. Several factors are important in the discussion of these needs.

1. Frequently the needs relate to qualitative interpretations of both the visual landscape and the cultural considerations. Quantification of these needs as, for example, so many units of landscape quality per person, is not possible at this time.

2. The needs which have been identified are only those which can, at least in part, be influenced by water and related land resources management programs.

3. Where appropriate, the unit of measurement for needs is expressed in time and distance from the population to be served, such as within one hour's driving time of the center of major metropolitan areas.

In general terms, the needs relate to the requirement for quality, opportunity and diversity in life style and environment. More specifically these requirements, as they relate to this study are defined as:

1. The need for the preservation of unique natural landscapes including specific resource areas, wilderness or wildlands quality areas, areas of scientific value, and the preservation of unique cultural landscapes and/or features including significant historic and archaeological sites.

2. The need for a quality visual landscape - both natural and man-made. The need to protect the existing areas of quality from deterioration and to improve the substandard areas through development programs.

3. The need for landscape diversity in the physical environment and the need to protect those composite landscapes where diversity is an integral landscape value.

4. The need to improve water quality in and around the major population centers containing the majority of the NAR population.

5. The need for improved and increased urban amenities - visual and physical access to urban waterfronts, open space, water-oriented recreation facilities, water for cleaning streets and sidewalks - for air conditioning - for fountains and

for maintaining green grass and healthy thriving trees in the urban environment.

The Preservation of Unique Natural and Cultural Landscapes: The importance of preserving examples of naturally occuring ecosystems for scientific work has been recognized for some years. The relatively undisturbed ecosystem which is fairly stable and not apt to change drastically in a few years has considerable value as a check or control area for managed lands. For example, the short or long term environmental effects of forestry practices or recreational uses on forest lands can be understood only when compared to relatively undisturbed forested areas.

Larger areas removed from centers of population and remote from roads, trains, airports and navigable waterways may, while lacking in certain values significant for scientific study, be of equal importance because of their wilderness quality. The quantity and therefore the quality of wilderness in the landscape is rapidly diminishing and especially in the eastern half of the country. A major criterion for assessing wilderness quality, in addition to remoteness and absence of human artifacts is size. Areas must be large enough to effectively filter out all peripheral incompatible activity. Criteria for the NAR, because of the scarcity of this quality, may include the acceptance of careful timber harvest and related forest management practices.

Increased attention has also been focused in recent years on the preservation of buildings, structures and sites associated with the history and the prehistory of the land, the country and the culture. Preservation of these historic and archaeological artifacts and sites does not mean isolation of the site or object but rather of relating it to the lives of the people who use it. Preservation is in fact basic to their continued use and value.

These buildings, structures and sites are tangible examples of the values and actions which represent where we have been both as a nation and as individuals, and how we got to the present. They include social, economic and aesthetic values and represent actions and artifacts of warfare as well as the accomplishments of community building.

Significance in reference to natural and cultural areas has, for this study, been defined as significant at the scale of the nation, the region or, as a minimum, the state. This level of significance is assumed to be commensurate with a regionally oriented planning approach. It is not intended to deny the value of the local site or monument but rather to deal consistently with comparable data that relate to the scale of the planning program.

The identification, however, of significant historical, natural and other cultural sites within the NAR presents a perplexing problem. Perplexing because available information is inconsistent in both quality and quantity.

Three states within the NAR have published inventories or catalogs of natural areas to date. Open space plans of many states include natural areas and historic sites but criteria for the inclusion of these areas in open space plans vary from the suitability of the individual sites to support recreational activities to the importance of a site as a link in a system of green ways or its intrinsic value as a natural area or historic site. Of the published inventories, Reports 1 and 2 of the Natural Areas in Vermont include significant ecosystems classified under the categories of:

1. Artic-Alpine Communities
2. Coniferous Forests
3. Deciduous Forests
4. Marshes
5. Bogs
6. Ponds
7. Rare Species

The inventory did not include significant geological or archaeological sites. The Catalog of Natural Areas in Maryland includes areas of unique historical, geological and ecological value of statewide significance. Both of the studies set similar criteria for site selection in terms of the site integrity of typical ecological units and in reference to the existing natural or near natural condition (being able to recover the natural condition in a short time if protected).

Other sources consulted include travel guides, natural history books, planning reports, state histories, state tourist literature and National Park Service publications. Of these sources, the only one with consistent criteria as to significance is the National Park Service publications. This source then was the primary resource. The sites which have been included

in the river basin summaries (Section VI) are those which met the uniform criteria of the National Park Service for natural areas (National Parks and National Monuments), for historical areas (including prehistoric) and for registry under the National Landmark Survey as Natural Landmarks and Historic Landmarks. Sites in the latter category, National Landmarks, are both publicly and privately owned and possess exceptional significance in illustrating or commemorating the natural character or the historic heritage of the United States.

Specifically, historic and archaeological sites which are listed had to meet one of the following criteria:

1. A National Historic Landmark - a building, structure, site or district of national historic importance not administered by the NPS.

2. A National Park Service site - a site administered by the NPS exclusively or in cooperation with a state or local agency.

3. A site identified in the NPS survey Parks for America, 1964, as a state-wide significant historic monument.

Natural areas which are listed had to meet one of the following criteria:

1. A National Natural Landmark - an area of outstanding geological formations, significant fossil concentration, unique ecosystems, scenic grandeur, special habitat or relating to important scientific discoveries.

2. A National Park Service site - a site administered by the NPS exclusively or in cooperation with a state or local agency.

3. A site identified in the NPS survey Parks for America, 1964, as being of biological or geological significance at the state or national level. Sites were limited to those possessing the qualities necessary to meet the requirements of a state park, wilderness area, scientific monument or a nature preserve.

4. A National Audubon Society area.

Because of the variability of criteria used in the other sources consulted and because of the lack of similar data for all states within the NAR, they have been used as secondary resources. Particularly relevant resources such as the Vermont, New Hampshire and Maryland inventories are cited for those basins which they include.

Additional sites which were also identified as very significant at the state or regional level in several of the secondary sources are included within the text for specific basins in Section VI. An attempt has been made to use inventory data of comparable quality and that is consistent with both the scale and level of detail of the NAR plan. While most major sites are included, the inventory cannot be accepted as complete by any means.

The Protection and Development of Landscape Quality: The landscape analysis provides an evaluation based upon natural landscape qualities and cultural patterns. The geographical distribution of quality visual landscapes is also delineated. Of particular import is the relationship of this distribution to the major population centers.

The concern for quality in the visual environment has not been quantified. There are indicators however that it exists. It is most often expressed in terms of the kinds of landscapes sought for recreational activities (this is also frequently an expression of a need for diversity) and in the kinds of areas sought for living environments when locational or economic constraints are not overriding influences. Visual landscape quality is defined as a landscape pattern which is clearly legible and which is composed of pattern generating elements arranged so as to maximize visual satisfaction and stimulation in conjunction with the varying degrees of contrast and spatial variety created by the existing landform. The two-dimensional distribution of the pattern generating elements relates to and is mutually reinforced by the complexity and magnitude of the landform. These are landscapes which possess great variety in the scale and distribution of open space, forests, lakes, wetlands, urbanized areas and landform. The landscape is relatively free of misfits.

The approach to problems of quality in the environment in the past has been most frequently from the standpoint of eliminating the misfit. This approach is possible in reference to the landscape image but is

most effective when oriented to individual sites. To this end the design and construction of each physical water management device becomes an issue of paramount importance. The influence of individual physical devices on the image or quality evaluation of a Landscape Unit, however, will be quite minimal unless it is exceedingly large or used in great abundance.

Under consideration at the scale of the Landscape Unit is the protection of those landscapes which have been recognized as possessing a general overall image of high value. The improvement of visual value in certain Units by the selection of those water management devices that have the greatest potential for making positive contributions is to be considered also. Improvements in value are most likely to occur through changes in landscape pattern at the site level initially, and, potentially with cumulative effects at a larger scale. These changes may include the addition of water bodies to the landscape, or flood plain and watershed management practices that encourage the orderly distribution of open fields and forested hillsides.

The primary criteria for the identification and consideration of these areas for protection and development are: for protection, the potential for reduction of quality in existing landscapes because of great development pressures, and for development, scarcity of quality landscapes in proximity to major population centers.

The Protection of Composite Landscapes: Diversity is an important attribute of stable and adaptable ecosystems. Biologically, the more diverse the ecosystem, the more readily it can adapt to and absorb changes in components without a major change in the entire system. Similarly, diversity is an important cultural attribute in that culturally diverse societies can accomodate a wider range of human values and thus provide increased options for choice of life style.

Both biological and cultural diversity are integral parts of landscape diversity. The relationships between the living organisms and the environment of the so-called "natural system," coupled with man's manipulation of them, or cultural actions, produces the landscape we see. Diversity as such is obviously an important element that contributes to quality within specific landscapes - the way in which hills, water, vegetation, etc. are arranged can determine whether a

specific Farm-Forest or Town-Farm landscape is evaluated as of high or low visual quality.

The focus of this concern however is the diversity created by the juxtaposition of different landscape patterns within the region rather than the diversity within a specific pattern. The different patterns are indicative of different life styles and different eco-systems. The names of some of the patterns are partially indicative of life style at a gross scale, for example, Farm and Town-Farm. The former implies a greater emphasis at least areally on agriculture. Forest-Town patterns are also frequently coincidental with popular tourist and vacation areas.

The places where the juxtaposition of four or five different patterns create composite landscapes are limited in the NAR. These are places where the value of the composite landscape is, by virtue of the diversity, greater than the individual values of the Series and Units of which the composite consists. These composite landscapes provide opportunities for people to experience a variety of environmental settings and also a variety of potentially different interactions.

The main criterion for the identification of composite areas where landscape diversity is to be protected is the juxtaposition of at least four or more Landscape Units and/or Series within an area of fifty miles diameter. Thus an individual could experience within approximately one hour's driving time, four or more distinct landscape images or impressions.

Certain combinations of landform and pattern create composite landscapes of unique value with special regional characteristics. The combination of Series and Units along the coast and the combination of farm patterns juxtaposed against linear ranges of mountains or steep hills covered with forests are such landscapes in the NAR. The major agricultural valleys with undulating open floors not only constitute an important cultural landscape but also are of important visual value providing opportunities for extensive views and vistas across open fields to the forest covered hills and mountains. The coastline provides similar composite visual and cultural values. These two composite landscapes, the coastline and the major agricultural valleys are of unique regional significance.

The Development of Improved Water Quality: Every major city in the North Atlantic Region is located on either a river or an estuary. New York City has a total of 578 miles of waterfront with 43 miles in Manhattan; Baltimore has about 40 miles of waterfront; Newark has 13 miles; Philadelphia has 24 miles of riverfront and Boston has 25 miles of docking space in the inner harbor. Water quality in most every instance precludes use of that resource for contact activities such as swimming. Hence, water is frequently brought from reservoirs a considerable distance away to fill an usually inadequate number of swimming pools. Greater numbers of people could be accomodated and correspondingly larger facilities developed if the water was raised to acceptable water quality standards and access could be provided to these rivers or estuaries.

Improved water quality, if it is to satisfy the needs of the urban dweller, must be accompanied by improved access to the water. People can receive the maximum benefit from water when they have unrestricted access to it. They are able to derive maximum enjoyment when they have both physical and visual access. Where physical access must of necessity be limited, thoughtful consideration to and development of opportunities for visual access can help compensate for this limitation.

The Development of Urban Amenities: Water has always been an object of attraction and pleasure for man as well as an object of utility and sometimes even of fear (as when the supply of water is limited in drought or is overabundant as in time of flood). Water can serve several uses at the same time as demonstrated by: the Roman Fountains -- water supply, urban design elements and landmarks; fire hydrants -- fire protection and children's play; the water's edge -- working space and visual attraction; and water courses -- conservation and definers of city form. These attributes of water must be exploited to capitalize upon the numerous opportunities that exist for enhancing the city environment. For many inhabitants of the city, especially the slum dwellers, water could provide a singularly significant amenity value if it were available in sufficient quantity and quality. The slumdweller cannot participate in the weekly exodus of the urbanites and the suburbanites to the inland lakes and to the ocean shore. The slim dweller does not have the requisite mobility to participate in this essentially middle class, short term migration and to enjoy the involvement in a different environment which it affords.

Fountains in the city can contribute in a major way to the visual environment and in a minor way to the cultural environment. The satisfaction of simply knowing that it is there and its inevitable attraction for children are both values to be considered. But, the rivers and estuaries can be of far greater significance both visually and culturally. The quality of the water and the water's edge are critical factors influencing the degree to which the potential of the resource can be realized. The need for a major regeneration of environmental quality in the slums of essentially every city in the North Atlantic Region has been widely discussed. The exploitation of the water's edge to enhance the visual environment and, of greater importance, to contribute to the opportunities provided the urban dweller for a wider range of activities and environmental experiences, should be an integral part of the city regeneration. Water is the key to the establishment of a sense of nature in the city. The ocean front, rivers, ponds and marshes are the foci of environmental quality and amenity concerns.

In most existing Center City and Intermediate City waterfronts physical access to the water, for most people, is extremely limited, if it exists at all. These water edges and surfaces constitute the largest unexploited opportunities for providing amenity values for hundreds of thousands of city dwellers who lack the means of travel to the mountains or country for diversity in their life patterns. The water surface, if visible, is a major open space in contrast with the buildings and streets of the Center City and Intermediate City areas. This water surface and edge could provide much needed recreational opportunities within the area that is normally serviced by public transit in most cities.

The edges "provide the chance" for injecting or creating numerous opportunities for new visual and physical amenities. The edge should be a union of the water with the city rather than a barrier.

Water can also mean the difference between clean streets and dirty ones. Similarly, adequate water is an essential element in the maintenance of green lawns of the single-family residential district and public open spaces and of healthy thriving trees in the city.

The water orientation of much contemporaneous open space planning is based upon criteria such as discouraging development on badly drained soils with low bearing

powers and percolation rates, protecting ground water recharge areas, protecting wildlife habitat areas and flood protection programs. Criteria developed with an emphasis on scenic or visual value and on opportunities presented for human use, particularly recreational opportunities are equally important.

At the metropolitan scale, many of the waterways -- river, streams and drainageways still exist in a natural or seminatural state and have the potential to be major determinants of the form of ever-expanding metropolitan areas. If the water course and its land area is included in the open space system its role and importance as an edge is enhanced. As a band of undeveloped landscape, it stands in contrast to the adjacent developed land and, it serves as a visual boundary and a definer of the form of the development. If on the other hand, development encroaches and the center line of the stream or river becomes the back lot line for a series of subdivision lots, or it is encased in a concrete ditch in the name of efficiency, the visual value as part of the public landscape has been destroyed. The value of the water course as a form-giver by defining the limits of a sector of metropolitan growth is completely lost. And, the potential to create extensive recreational opportunities for the public is effectively eliminated.

These linear open spaces also represent a change in pattern and visual contrast -- contrast of a landscape dominated by natural materials with the adjacent cityscape dominated primarily by buildings and pavements.

LANDSCAPE PLANNING AND MANAGEMENT

The previously discussed needs are related to three broad approaches to landscape planning and management; preservation, protection and development. These three approaches are intended to relate the needs to the water resources planning objectives and to the most effective water management devices to be used in the formulation of the regional plan.

Preservation: Preservation is applicable to those landscape resources which are unique or of exceptional value such as wilderness quality areas, natural and historic sites and some of the still undeveloped stretches of coastline. It is an approach already used in conjunction with some existing state and federal

land holdings in the region. It is not intended as an absolute prohibition of development but rather one of limited development or use sympathetic to and in harmony with the intrinsic qualities of the landscape or cultural feature -- allowing use commensurate with the visual as well as the ecological carrying capacity of the landscape. In other words, environment of unique natural quality should not be developed intensively and begin to assume more man-made oriented images. Nor should they be developed to the extent where their threshold of tolerance to human activities is exceeded and the very qualities that contribute to their uniqueness are destroyed. Water management programs employing primarily physical devices are likely to be in conflict with areas possessing values worthy of preservation.

Protection: Protection is an approach applicable to a substantial portion of the landscape of the North Atlantic Region which, while not unique, is of high quality visually and offers a range of opportunities for enhancing cultural experiences. The values may be in the form of recreational opportunities, major agricultural areas of high scenic value or particularly attractive living environments for urban and suburban growth. Water management programs (as well as other resource development activities) must be approached from the standpoint of compatibility of the proposed program with the existing environmental quality. The opportunity for the development improving the visual environment is minimal but the danger of reducing quality is great.

Development: The development approach is based on the premise that in certain landscapes, water management programs can be effective tools for improving existing visual and/or cultural qualities. It is particularly suitable for those landscapes where inappropriate use and building has wrought damage to flood plains and watersheds and to those landscapes that would be appreciably enhanced by the addition of water bodies (impoundments) for both visual and physical use. Development is intended to provide urban amenities and serve as a framework for urban expansion.

NAR PLANNING FRAMEWORK

Planning Objectives: The framework established for the development of the NAR water resources plan extends

over a fifty year planning period to 2020, with intermediate bench mark years set at 1980 and 2000. The three primary comprehensive planning objectives are environmental quality (E.Q.), regional development (R.D.) and national efficiency (N.E.) For this report it was assumed that the environmental quality (E.Q.) and regional development (R.D.) objectives are identical. It was assumed that regional aspirations and well-being would include concern for optimal environmental conditions in harmony with regional development patterns. It was also assumed that in the satisfaction of the national efficiency objective, the maximization of national income could result in lower investments for visual and cultural needs.

Assessing Needs: Table N-1 shows the criteria used in assessing the general magnitude of the needs in individual river basins for the plan formulation and the suggested devices to be used for satisfying the needs. The criteria indicate, for example, that clean water should be available within the 2½ hour time-distance zone under both the E.Q. and the N.E. objectives. The area in each basin in terms of location and size, where management programs for improved water quality is needed is directly related to the percent of each basin that is urbanized. Under protection of quality landscapes (and protection of landscape diversity) however, 30 percent of the land evaluated as of high quality (or evaluated as a composite landscape) is earmarked for protection within the one hour zone under E.Q. and 15 percent under N.E. The percentages for preservation of unique landscapes under both E.Q. and N.E. are the same because of the limited supply and irreplaceable quality of these resources. It seems reasonable to assume however that some areas will be lost near the major population centers, hence the 80 percent figure for both the one hour and two and one-half hour zones.

Further distinction between the two objectives is indicated by the suggested devices to be used. For example, the criteria indicate that fifty percent of the landscapes evaluated as of high quality should be protected within the 1 to 2½ hour time-distance zone under both the E.Q. and N.E. planning objectives. Under E.Q. the suggested devices are fee simple purchase and easements. Under N.E. the suggested devices are easements, zoning and tax incentives. Thus a higher degree of public ownership and control is suggested under E.Q. with concomitantly higher costs.

TABLE N-1

RELATIONSHIP OF NEEDS TO PLANNING OBJECTIVES

NEEDS	Environmental Quality Objective						National Efficiency Objective					
	To 1 hr.		1-2½ hrs.		over 2½ hr.		To 1 hr.		1-2½ hrs.		over 2½ hr.	
	%*	Device	%*	Device	%*	Device	%*	Device	%*	Device	%*	Device
Preserve unique landscapes	80	FS,ZO	80	FS,ZO	100	FS,ZO	80	FS,ZO	80	FS,ZO	100	FS,ZO
Protect land-scape diversity	30	FS,EA	50	FS,EA	80	FS,EA, ZO,TI	15	EA	50	EA,ZO, TI	80	ZO,TI
Protect agricul-tural valleys			80	PL	80	PL			80	PL,ZO TI	80	ZO,TI
Protect quality landscapes	30	FS,EA	50	FS,EA	80	FS,EA ZO,TI	15	EA	50	EA,ZO, TI	80	ZO,TI
Develop quality landscapes	30	FS					15	PL				
Develop clean water	X	ZO,TI	X	ZO,TI			X	ZO,TI	X	ZO,TI		
Develop metro-politan amenities	5	FS					5	FS,PL				

* percent of suitable land within the designated time-distance zone

See Section V for definition and evaluation of the suggested devices:

FS - fee simple purchase
PL - purchase lease-back
EA - easement
ZO - zoning
TI - tax incentive or subsidy

Priorities: The needs and devices must also be related to the fifty year planning period and the bench mark years of 1980, 2000 and 2020. The preservation of unique landscapes and the protection of the major agricultural valleys is consistently given priority for 1980 because of the limited quantities of these important landscape resources and their susceptibility to diminution in quality and/or quantity by changing land use patterns. Similarly, development of clean water and metropolitan amenities are given priority for 1980 (and 2000 under the N.E. objective for metropolitan amenities) because of the relationship to population concentrations and areas where the needs are great. The recommended satisfaction of the other needs is by the assignment of one-third increments to each of the bench mark years. The places the highest priority on the 1980 date because the initial time interval is 10 years (1970-1980) while the second two are 20 years each (1980-2000 and 2000-2020).

The magnitude of needs for each basin is given in Section IV. Those data are presented in greater detail in relationship to specific devices and probable costs.

Costs: The costs which were developed in the basin summaries (Section VI) for the visual and cultural needs are costs related to land; for fee simple purchase, for purchase of easements, for purchase and lease-back and for tax incentives or subsidies. It is assumed that the costs for other aspects of the needs such as water supply and waste treatment are covered in the Appendicies dealing with those sections of the plan. Appendix G, pages G-162 through G-187 contains a table (G-74) comparing production costs per acre under National Efficiency with costs per acre for Environmental Quality.

The development of cost data is a multi-dimensional problem. First there are the three general criteria of environmental quality, regional development and economic efficiency. Second there is the cost to be developed by four categories, fee simple, fee simple with lease-back, easements and tax incentives. The third dimension is the time-distance from the major metropolitan areas. Then if the different types of soil, topography, cover, land use, location, zoning, etc. and the different proportions of each of these types of land that is to be preserved, protected or developed at various locations within the North Atlantic region are superimposed, the cost calculations become quite complex. This, even though the different demand characteristics for land due to potential development, local demand, the tendency to migrate from the central city to the suburbs

and there consuming greater quantities of land per capita, etc. are ignored.

The price elasticity of demand for land is also very important. For instance, if the demand for land is inelastic as small quantities are purchased by the public and removed from the market, the percentage increase in the price of the remaining land will be greater than the percentage of the total land which was purchased and removed from the market. Thus, a public purchase program would face a very rapidly increasing price structure as purchases were continued. On the other hand, if the demand for land was elastic, the percentage increase in price would be less than the percentage of the land which was removed from the market.

Demand elasticities for land of various characteristics are not well documented at the present time. Even if they were, there is a possibility that the elasticity would change as public purchases removed land from the private market. Thus, if a purchasing program was started on land where the demand was originally elastic, it is possible that as purchases were made, the demand would become inelastic and the price would then rise at a more rapid rate than the rate of actual purchase. Since there is not enough known about the demand for land, such impacts could not be predicted.

Within the limitations of this study the following procedures was used for developing cost figures. The basic assumptions are:

1. That all demand generates from the major metropolitan areas.

2. That the impact of different levels of public purchase will not affect the demand elasticity and thus the price of land.

3. That the only difference in the land of various types of purchase under the different planning objectives, i.e. environmental quality, regional development and economic efficiency, would be the quantity purchased.

The sphere of influence was assumed to be the time-distance zones or travel times for each of the major metropolitan areas. Estimates of fee simple cost per acre was made for agricultural land and forest land. Prices were estimated for such land within 1 hour, from 1 to 2 1/2 hours, from 2 1/2 to 5 hours, and more than 5 hours from the metropolitan areas.

TABLE N-2 -- ESTIMATED FEE SIMPLE LAND VALUES FOR NAR
FOR SELECTED LAND USES
BY NORTH-SOUTH GRID AND DRIVING TIMES

Time/ Distance Zone	Agricultural[a/] Land ($)/acre	Forest[b/] Land ($)/acre	Seashore[c/] ($)/front ft.
Northern Maine			
5 hr.+	133	7	0.25-1.00
2½-5 hr.	133		0.50-2.00
Northern New England			
5 hr.+	253	14	----
2½-5 hr.	188	15	0.50-4.00
1-2½ hr.	213	48	4.00-100.00
to 1 hr.	584	306	100.00-250.00
Southern New England - NYC			
5 hr.+	279	16	----
2½-5 hr.	279		----
1-2½ hr.	769	48	50.00-250.00
to 1 hr.	769	320	250.00-5000.00
Washington,DC - NYC			
2½-5 hr.	398	11	----
1-2½ hr.	640	68	50.00-250.00
to 1 hr.	946	437	250.00-5000.00
South of Washington,DC			
2½-5 hr.	216	6	10.00-50.00
1-2½ hr.	326	29	50.00-100.00
to 1 hr.	763	185	----

a/ Calculated from Tables 3 and 5 and estimated by linear function for 1970 from: Farm Real Estate Taxes, RET-8, ERS, USDA, Dec. 1968. 1970 values ranged $106-946/acre.

b/ Calculated from Swanson, Dale, A Report of the Tax Revenue Derived From Forest Land in the Commonwealth of Mass., Dept. of Forestry & Wildlife Mgmt., U. of Mass., 1967. Full value of forestland within time grids for Mass. were extrapolated to other states in region via value relationship established in footnote a/ above and estimated by linear function to 1970. Values per acre ranged from $0.18 to $2900.00

c/ Simple "guesstimates" based upon isolated cases in Maine, Boston, Cape Cod, and the Maryland Coast.

For land purchase and lease back, it was estimated that the annual "net over owner cost" return would probably not exceed two percent annually of the fee simple value (price) of the land. (Farm Real Estate Market Developments, CD-73, ERS, USDA, August 1969.) The owner cost does not include an opportunity cost charge for the value of the lost return which could have been earned on the alternative use of the funds used for land purchase. Thus it would take an estimated fifty years to recover the dollar amount of the original investment even without an interest charge.

Use of permanent easements has not been widespread, primarily because the cost of such easements has been from 75-90 percent of the fee simple cost of the land in many places. Another problem has been that a specific statute making scenic or development easements a transferable right must be enacted for the use of this device. Its potential use in the NAR is probably in areas beyond the 2½ hour driving time zone.

Tax incentives have been used in various states. The Northeast experience seems to indicate that the assessed values of preferentially treated land tends to decrease relative to other land at about two percent per year. Thus, where the initial loss of assessed value is low (indicated at 0.27 percent in Connecticut) the cumulative cost over time increases at about two percent per year.

DEVICES

Devices are the operational means of managing water and related land resources to satisfy needs. The evaluation of devices for this study was directed at two specific questions:

1. Which devices contribute most significantly to the satisfaction of visual and cultural needs?

2. What is the probable visual, cultural and ecological impact of the various devices in different landscapes?

The many devices used in water resources management such as flood walls, impoundments and watershed management each have unique and different characteristics and thus vary in degree of impact on the visual landscape; on how people use the landscape; and on the natural plant and animal communities.

Visual Considerations: The analysis of the visual impact of water management devices on the landscape considers the relationship of the device itself to the existing landscape and also the visual implications of the uses made possible by the device. In other words, the device itself may produce a direct change in the viewed landscape, and the impact of people using the land in a different way (made possible by the device) can also produce change in what the landscape looks like.

For example, an impoundment in a Rolling Hills Series, Forest-Wildland Unit would produce a change by introducing an opening with sharply defined edges in an area otherwise covered continuously by trees, thus creating a more varied pattern. Further change is created by introducing a contrasting horizontal surface in an area otherwise composed primarily of moderately sloping surfaces and by introducing a second natural element, water, which has a wide range of visual properties (color, motion, texture and reflective capabilities) not possessed by the existing forest. Hence a new element of great contrast is interjected in the otherwise homogenous landscape. These changes provide opportunities for vistas and views across the opening created by the impoundment. The water becomes an important element of foreground interest.

If the impoundment was created for supplying domestic water needs, and there is no concurrent provision for intensive use of this new landscape feature, the visual changes generated by the actual addition of the impoundment to the landscape are basically all that will occur. There will also be continuous but usually gradual and visually minor changes brought about by natural processes.

If, however, the impoundment was created for recreational purposes, there can be a number of additional very significant changes in the viewed landscape, which are brought about by the accomodation and impact of man. Additional openings will be created and new elements such as buildings, parking lots, playgrounds, etc. will be placed in the landscape to accomodate circulation, parking requirements and other recreational needs. In and of themselves these changes are neither assets nor liabilities in terms of landscape quality. They can be either, depending upon the skill and the talent with which they are designed and constructed. They do, however, influence landscape pattern. The presence of man in large numbers interjects an element of animation, form and color which contrasts sharply with a landscape populated with few or widely dispersed individuals.

The criteria utilized in analyzing and evaluating the relationship of the water management device to the viewed landscape (Landscape Series and Unit) and the secondary changes brought about by man's extensive or intensive use are concerned primarily with questions of the dominance, fit and potential of a given device.

The device in question may be a single physical entity such as a cooling tower or levee or it may be the totality of a viewed landscape subjected to management practices.

Dominance relates to:

The magnitude of the area in which the device can be seen.

The proximity of the viewer to the device.

The degree of contrast in the size and form of the device in relation to the surrounding landscape.

Fit relates to:

The influence on the continuity of form and pattern in the landscape.

The extent to which the device controls or limits views and general visual access to the adjacent waterscape and/or landscape.

The amount of visual distraction a device creates, its lack of adjustment or "misfit" qualities.

Potential relates to:

The potential for initiating other uses and hence secondary visual changes.

The flexibility and potential for change in the design and form of a device while still maintaining its intended function.

<u>Cultural Considerations:</u> The cultural considerations included in this study are those that are related to the influence of a specific device on the use of the land. They are also related to the consideration of amenity values that are gained or lost by the use or application of different water management devices. There is a strong tie between these cultural considerations and the secondary visual changes which are a product of man's use of the land.

The Landscape Series or topographic form of the landscape and the Landscape Unit or pattern are of approximately equal importance in the analysis and assessment of the visual impact of a device. Cultural impact, or the manifestation of man's use and manipulation, however, is related most strongly to the Landscape Unit or pattern. The Landscape Unit serves, at the regional scale, as a base against which the impact of the devices can be compared and to which it can be related.

If a river flood plain is immediately adjacent to a Fringe City Landscape Unit, and it is decided to use devices such as floodwalls and levees, the Fringe City pattern will probably be extended to cover all or most of the flood plain. Thus, the selection of the management device determines, in part, the limitations or lack thereof for different uses.

While flood walls and levees provide the opportunity for reasonably safer residential development they also preclude or make more difficult the use of the water course for amenity values such as boating and swimming. A physical barrier has been created between man and the water surface.

If flood plain zoning were the selected device, other opportunities for and restraints upon use would be produced. Direct access to the water surface would be possible and the previously mentioned amenity values could be realized easily. The flood plain could provide opportunities for uses that were different from the adjacent Fringe City such as agriculture and forest. These uses would also add variety to the landscape pattern and usually contribute to the total environmental quality.

The criteria used in analyzing the cultural impact of the devices on the landscape (Series and Units) are concerned with opportunities for man's use. Specific criteria are the dominance of use, the fit of the use, and the potential for new uses. Dominance of use relates to:

> The general proximity of large numbers of users to the land use.
>
> The type of land use in terms of extensive (low density) and/or intensive (high density).

Fit of the use relates to:

The stimulation of concentrated or dispersed land use patterns and their relationship to existing adjacent land use patterns.

The opportunity for the continuation of and/or the improving on an existing use in terms of both the quantity and the quality of the user's experience.

The compatibility of new activities generated by the device with adjacent existing activities.

Potential for uses relates to:

The creation of opportunities for new uses, and the extent to which the devices stimulate new uses.

Ecological Considerations: The approach taken to analyze the impact of water management devices on the ecosystem is one of assessing the changes in the age characteristics of the stream or lake and the consequent changes in the biota. It is assumed that the physical devices will have their most direct and strongest effect on the water and its associated biota rather than on the land. In the cases of physical-nonphysical devices, changes in terrestrial biota may be more pervasive, though not necessarily more significant than the changes in the aquatic community. It is assumed that modification of ecological characteristics may be internal to the planned development and implementation of any device, and also external to such a plan and its implementation.

Any precise definition of ecological change consequent to the implementation of any particular device is not possible under the present state of ecological knowledge. Further, the scale of the NAR study defies inclusion of all the known variables that would be revealed by an analysis of change at the site level. Given the limitations of knowledge and scale, the following concepts will provide the basis for determining the ecological impact of the several water management devices.

Peneplanation is the constant reduction of topographic features to the status of a plain through the action of gravity and all erosional forces. This is accepted as a geological trend rather than a geological fact demonstrable by any existing peneplain.

This concept is important in understanding the dynamic nature of the earth's surface and the overall direction for change which that dynamism expresses.

Water is the principal mechanical and chemical erosive force on the surface of the NAR. Thus, it is the most significant factor in peneplanation.

All water bodies on the surface of the earth are temporary whether they are flowing or impounded, natural or man-made.

All water bodies have a life cycle characterized analogously as periods of youth, middle age and old age, each respectively exhibiting differing water quality, quantity and time distribution characteristics.

Each age in the life cycle of a water body respectively supports a differing biotic community characterized by different plants and animals and different levels of biological productivity ranging from lower to higher as the water body proceeds from youth to old age. The rise in levels of biological productivity is accompanied by a rapid accumulation and cycling of dissolved mineral nutrients in the water as well as a rapid build-up of living and dead organic material. This process is called eutrophication.

The older a water body is the greater is the tendency to shift its productivity to semi-aquatic and terrestrial life forms. This is the aquatic phase of what is commonly called 'plant succession'.

The process of plant succession is expressed on the site of a former water body and on land. This process culminates in a plant community exhibiting the highest level of productivity within a given climatic zone. This process is accepted in this report as an ecological trend rather than a fact demonstrable by the existence of such a plant community.

The characteristics of water in each part of its life cycle determines its utility for man. In terms of water's most basic value, human consumption, youthful water bodies supply water of generally highest value. Such water is comparatively low in mineralization, is usually free of odors, contains little living or dead

organic material, is generally free of toxic substances and is high in dissolved oxygen. With respect to uses other than consumption by man, youthful waters are not as highly valued as a resource. Their biological productivity is low and thus they provide little food. In the case of youthful streams, the distribution of water through time is poor, thus lowering their value as a dependable source of water in desirable quantity.

Old aged water exhibits almost opposite characteristics. It is usually higher in mineralization, higher in odors, often carries heavy loads of living and dead organic materials and silt, is frequently contaminated by toxic substances and is lower in dissolved oxygen. In terms of quantity, old aged streams carry more water and deliver it with greater evenness through time. Old aged streams are also characterized by slow flow and much deposition of materials carried onto wide flood plains, dropped within the channel or piled up at their mouths as deltas.

Middle aged water bodies seem to present a compromise condition that offers the most resource values for society. Water is of a quality that requires only little treatment for consumption and industrial use. Productivity is moderately high. There are several levels through which energy flows and most biological production is contained in the aquatic community. In the case of streams, the quantity of water available through time can easily be made adequate by constructing storage devices. Also, the middle aged stream has a straighter channel than the old aged stream, thus allowing faster discharge of water during times of peak flow.

It is possible to generalize then that most water management plans seek to create a middle aged water condition through the functioning of any device or combination of devices applied to water management. The ecological impact made by the development of active devices can be interpreted as a biological response to engineered structures substituting for natural geological phenomena.

Classically all streams begin their life cycle as young streams and end it as old aged streams passing through middle aged characteristics on the way. It is expected that the streams will exhibit young, middle aged and old aged conditions in sequence from headwaters to mouth. Rarely do these classic conditions exist.

Actually, impounded waters follow more closely the expected sequence of aging than do streams. The relatively geographically fixed position of the water in lakes and ponds makes it subject to more uniform environmental factors through time and thus the accumulative chemical and physical changes may proceed unimpeded.

The streams and lakes of the northern states of the NAR all show variance from the classic aging norms. The superficial geologic events of the Pleistocene were undoubtedly more responsible for this variance. The southerly states were not subject to the glaciers and are more nearly representative of a landscape which has proceeded through time under a relatively unaltered process of peneplanation.

Glacial reformation of the New England river valleys has created a new distribution of life cycle characteristics along the entire stream. Where physical devices are not feasible in the engineering or economic sense, then comprehensive devices must be brought into play. These essentially restrict use of the water, the channel or the flood plain in an attempt to minimize potential social losses from negatively valued hydrological events such as floods.

Ecologically the impact made by the employment of any device or devices designed to produce middle aged hydrological conditions will of consequence produce middle aged ecological conditions. This is most directly felt on the site itself. But, since there is an integration of geological, hydrological and biological effects, some ecological impact may be witnessed off-site.

Creation of an impoundment in a more youthful part of a stream may produce a more highly mineralized and warmer body of water. This in turn will accelerate the development of a richer biota. Release of the water from this impoundment will result in an acceleration of the biological age characteristics downstream even if the river channel retains its youthful configuration and slope. The distance downstream from the outfall which is subjected to such an effect will likely depend on the relative conditions of youthfulness in the channel and the volume of youthful water already flowing.

Basically, the natural thrust toward aging will express itself whenever conditions arise that promote it. The general effects of human manipulation of water

are to accelerate the aging process. This statement stands despite efforts to render old aged streams more youthful. We rarely accomplish this since the most prevalent active devices used on old aged streams are directed at the flood channel (dikes, levees, walls) rather than the normal flow channel. In short, it is easier for us to age a body of water than to make it more youthful in either the hydrological or biological sense. In doing so we are following or abetting the forces of nature rather than trying to reverse them.

The criteria used for evaluating ecological impact are based on aging characteristics anticipated from the use of water management devices. Aging relates to:

The amount and type of biotic life the water body supports before and after device implementation.

The flow or movement characteristics before and after device implementation.

The visual characteristics of the water body before and after the use of the device.

The trend for change in age characteristics, acceleration, deceleration, or reversal of the process.

SECTION III: LANDSCAPE ANALYSIS

INTRODUCTION

The landscape analysis is presented in two sections; inventory and evaluation. The inventory section includes data on both natural landscape form and landscape pattern, both the "man-induced" pattern of structures, roads and fields and the "natural" pattern of forests, lakes and marshes. Landscape form is classified under Landscape Series and landscape pattern under Landscape Units.

Evaluation of the landscape is presented on two levels. The first is an evaluation of the quantity and the visual quality of the Series and Units separately and the second is a combined evaluation that relates pattern to land form. Quality landscapes are also discussed in relationship to the major population centers within the NAR; the Boston-Providence Metropolitan Area, the New York Metropolitan Area, the Philadelphia Metropolitan Area, and the Baltimore-Washington, D.C. Metropolitan Area.

LANDSCAPE INVENTORY

Landscape Series are defined as divisions of the landscape which are identified by the general visual impression gained from the repetition of a dominant land form over a large area. Series are further subdivided into Sub-Series which identify differences in the dominant form within the Series. The Series and Sub-Series which have been identified and mapped are:

Mountain: Dominant vertical dimension; at least 2000 feet of relative elevation between valley floor and ridgeline or peak, with a jagged or pointed profile.
Sub-Series:
- M-1 White Mountains
- M-2 Green Mountains
- M-3 Adirondack Mountains
- M-4 Catskill Mountains
- M-5 Blue Ridge/Appalachian Mountains

Steep Hills: High hills rising steeply from the base plane, ranging in height from 800 to 2000 feet above the adjacent base plane, usually with a strong vertical dimension and a rounded profile.

Sub-Series:

SH-1 Northern Steep Hills
SH-2 Vermont/Berkshire Steep Hills
SH-3 New York/Pennsylvania Steep Hills
SH-4 Blue Ridge/Appalachian Chain Steep Hills

Rolling Hills: Rounded hills with an apparent horizontal dimension ranging in height from 200 to 800 feet, low to moderate slopes and a rolling profile.

Sub-Series:

RH-1 New England to Pennsylvania Rolling Hills
RH-2 Southern New England to New York Rolling Hills
RH-3 Vermont Rolling Hills
RH-4 New York to Pennsylvania Rolling Hills
RH-5 Great Valley Rolling Hills
RH-6 Mid Atlantic Rolling Hills

Undulating Land: Variation in the horizontal ground plane without identifiable hill forms.

Sub-Series:

UL-1 New England to New York Undulating Lands
UL-2 Mid-Atlantic Undulating Lands

Flat Land: Dominant horizontal dimension with little or no variation in the ground plane.

Sub-Series:

FL-1 Mid-Atlantic Flat Lands

Compound: Combination or any two or more identifiable Series of essentially equal visual importance.

Sub-Series:

X-1 Appalachian Steep and Rolling Hills.

Coastline: Dominant water surface and the immediately adjacent strip of land.

Sub-Series:

C-1 Eastern Maine Coastline
C-2 Central New England Coastline
C-3 Mid-Atlantic Coastline
C-4 Southern New England Coastline

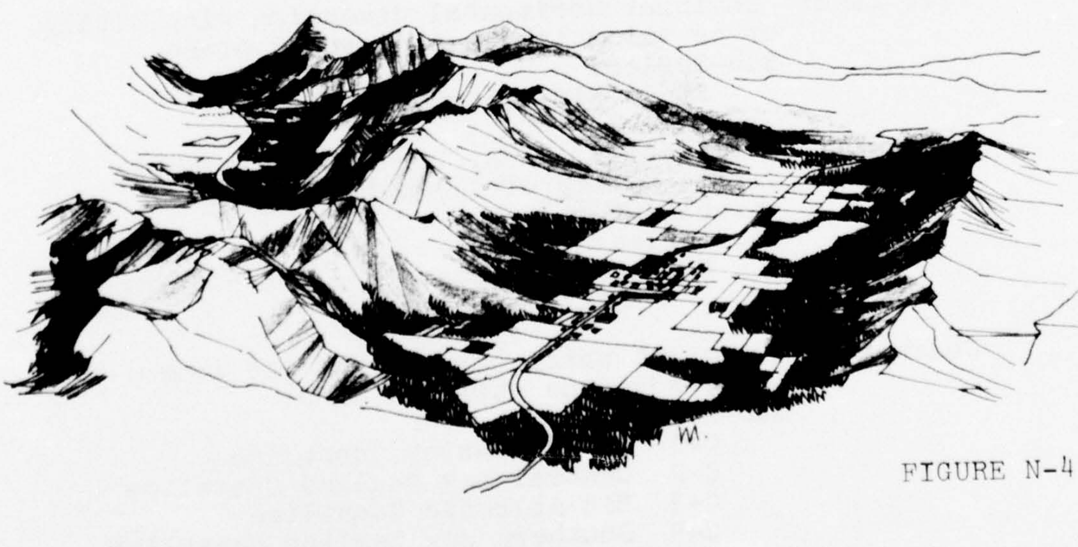


FIGURE N-4

Conical peaks randomly distributed in short and long rows

WHITE MOUNTAINS **M 1**

FIGURE N-5

Serrated linear ridges with
occasional angular peaks

GREEN MOUNTAINS **M 2**

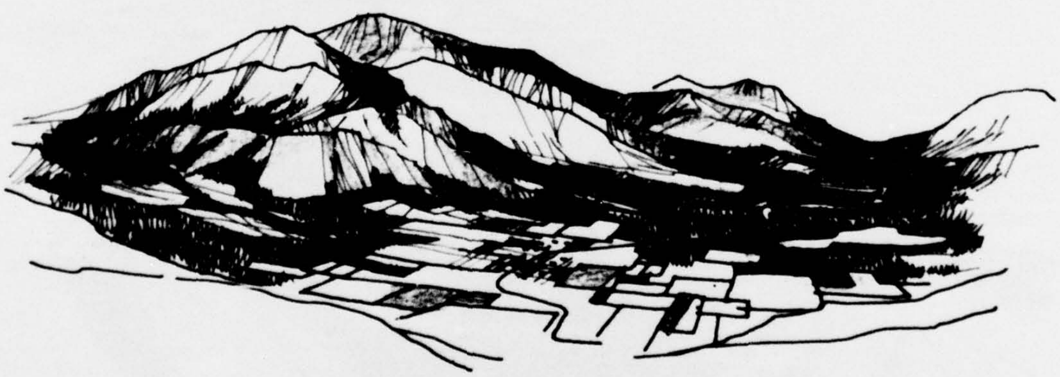


FIGURE N-6

Densely clustered pyramidal peaks **ADIRONDACK MOUNTAINS** **M 3**

FIGURE N-7

Long undulating ridges surrounded by lower conical peaks

CATSKILL MOUNTAINS

M 4

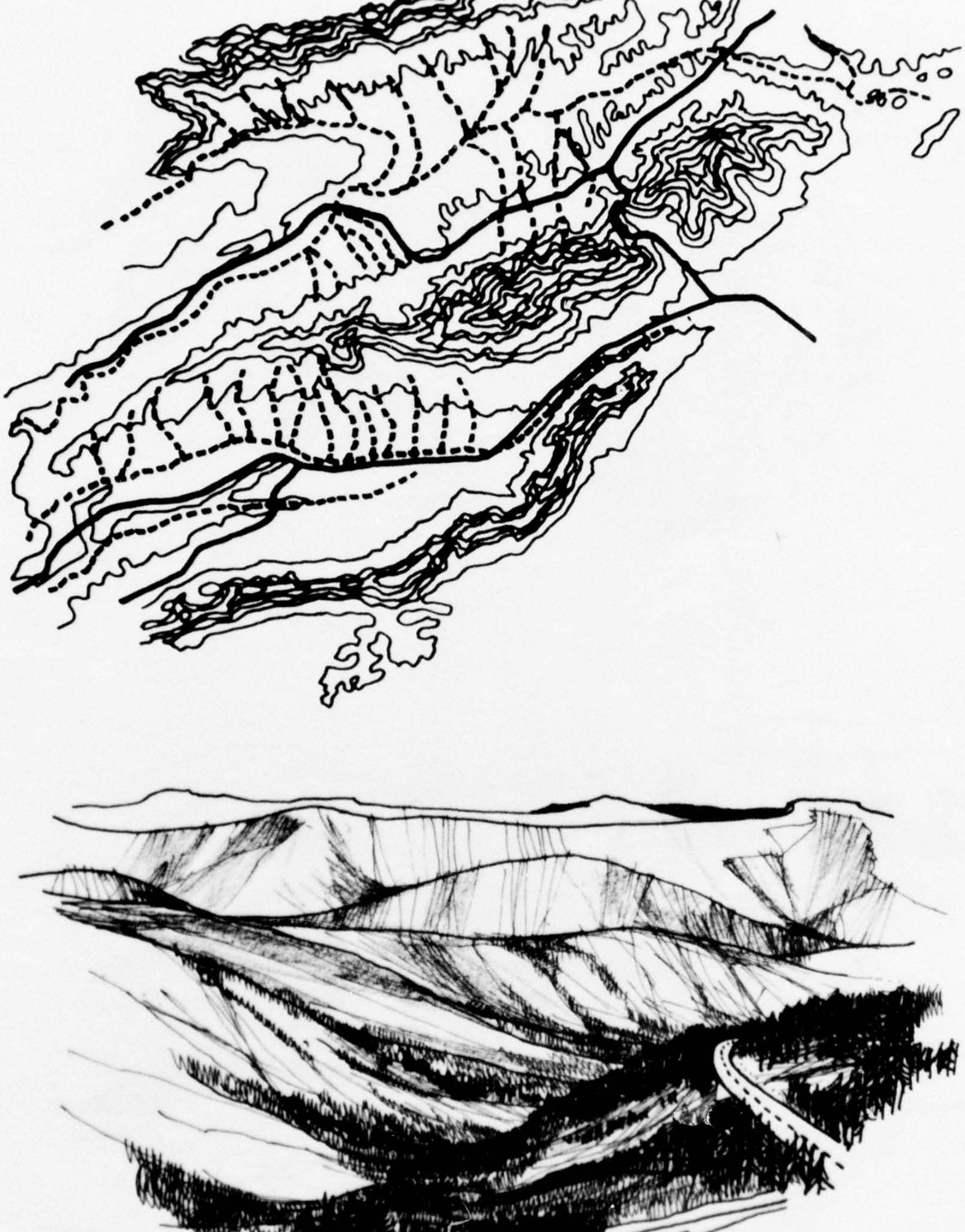


FIGURE N-8

Continuous linear ridges and occasional scattered conical peaks

BLUE RIDGE/ APPALACHIAN MOUNTAINS

M 5

FIGURE N-9

Individual and connected hills of varying height and size interspersed with many lakes

NORTHERN STEEP HILLS

SH1

FIGURE N-10

Serpentine valleys along major rivers and tributaries, frequently interrupted by secondary ravines

VERMONT/
BERKSHIRE
STEEP HILLS

SH2

FIGURE N-11

Long unbroken serpentine valleys

NEW YORK /
PENNSYLVANIA
STEEP HILLS

SH 3

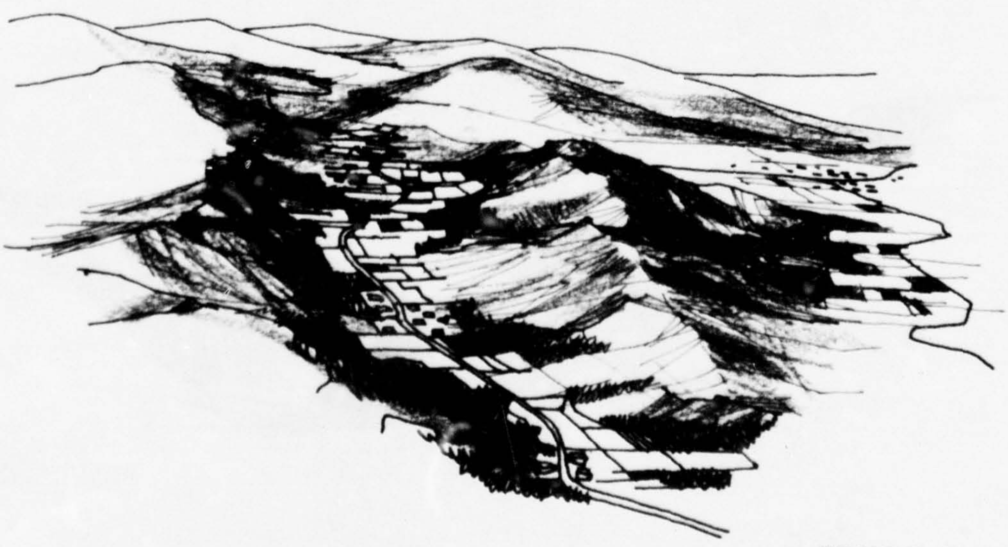


FIGURE N-12

Linear, rounded hills varying in height

BLUE RIDGE/ APPALACHIAN CHAIN STEEP HILLS **SH 4**

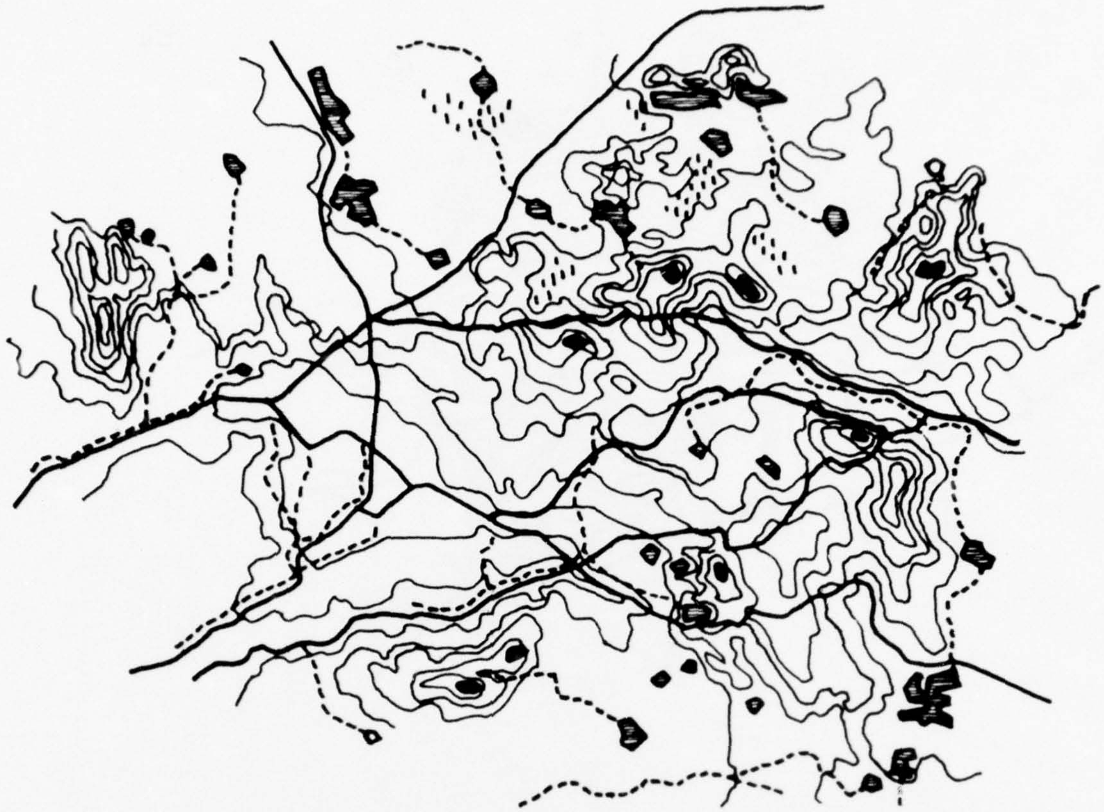


FIGURE N-13

Hills of uniform shape but varying height· hills interspersed with some undulating land and many lakes and marshes

NEW ENGLAND TO PENNSYLVANIA ROLLING HILLS **RH1**

FIGURE N-14

Rounded hills varying in size with scattered small lakes

SOUTHERN NEW ENGLAND TO NEW YORK ROLLING HILLS

RH 2

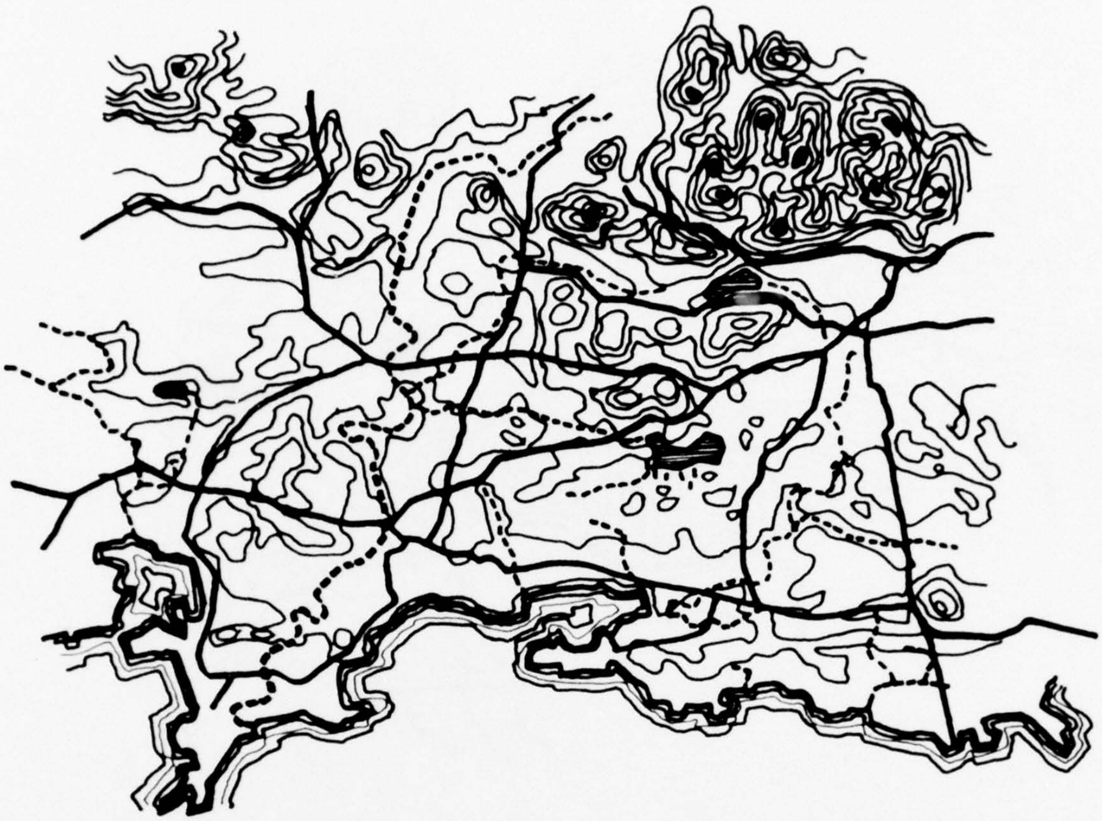
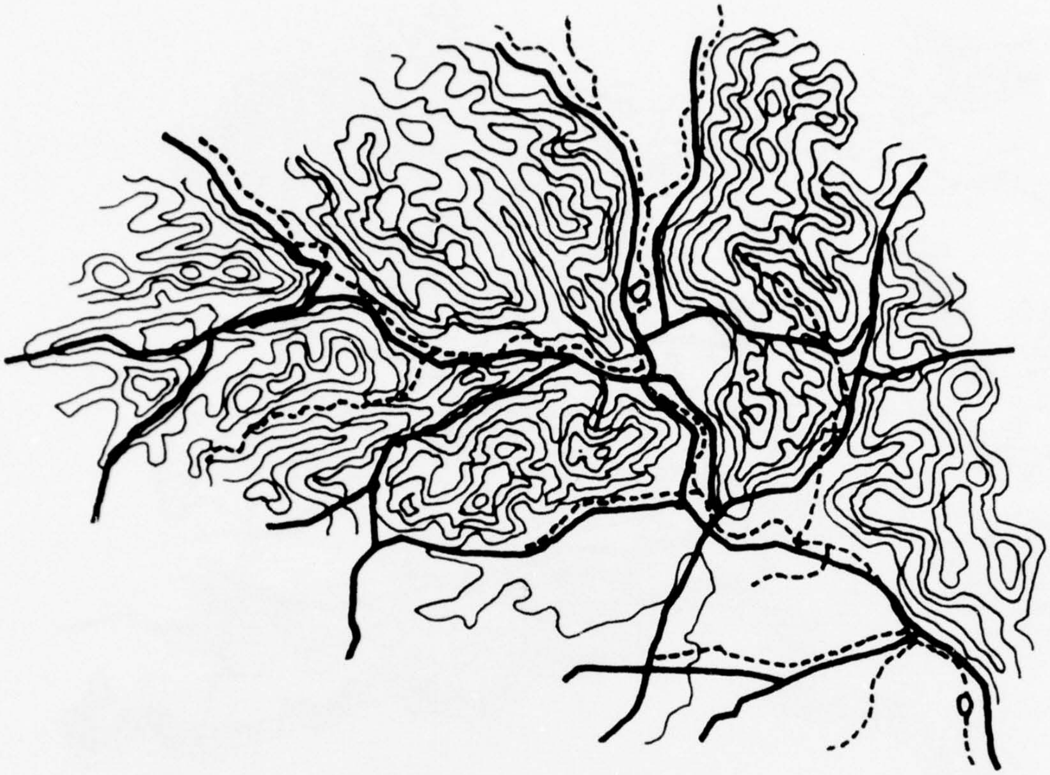


FIGURE N-15

Flat, rolling hills varying in height and shape with a large lake

VERMONT
ROLLING HILLS

RH 3



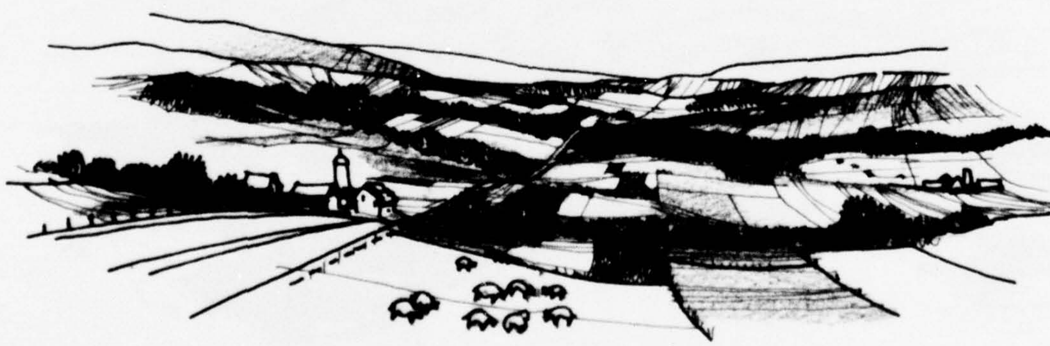


FIGURE N-16

Large, uniformly shaped hills

NEW YORK TO PENNSYLVANIA ROLLING HILLS

RH 4

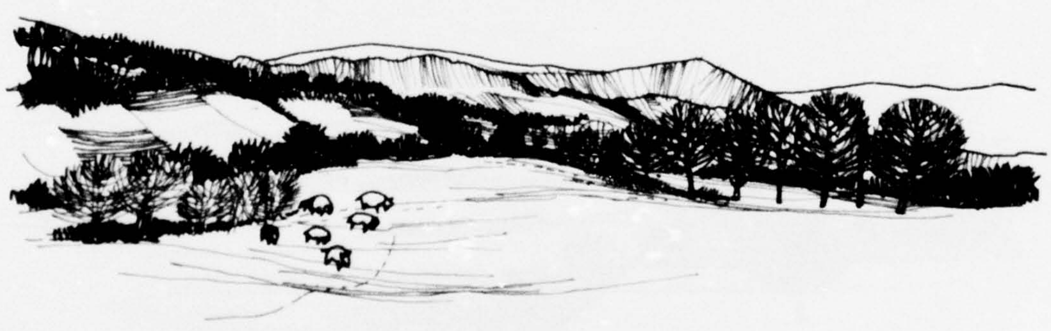


FIGURE N-17

Hills varying in height and shape

GREAT VALLEY
ROLLING HILLS

RH5

FIGURE N-18

Irregularly shaped hills with generally uniform height

MID ATLANTIC ROLLING HILLS

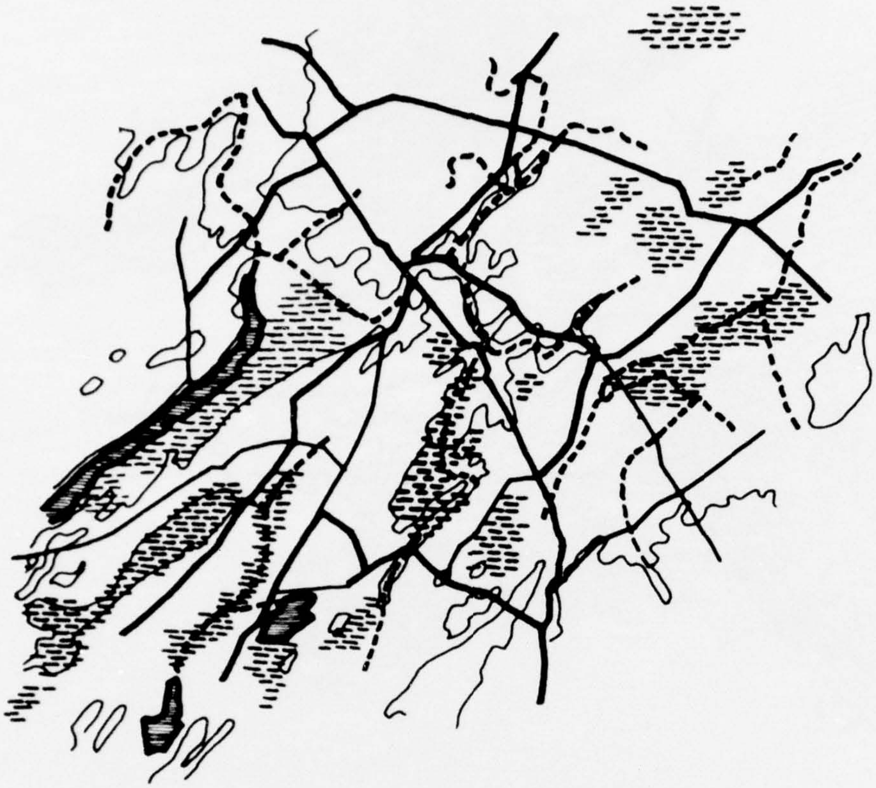
RH 6

FIGURE N-19

APPALACHIAN STEEP AND ROLLING HILLS

Long linear ridges with an even profile (steep hill series) alternating with broad valleys of irregularly formed hills (rolling hill series)

X 1



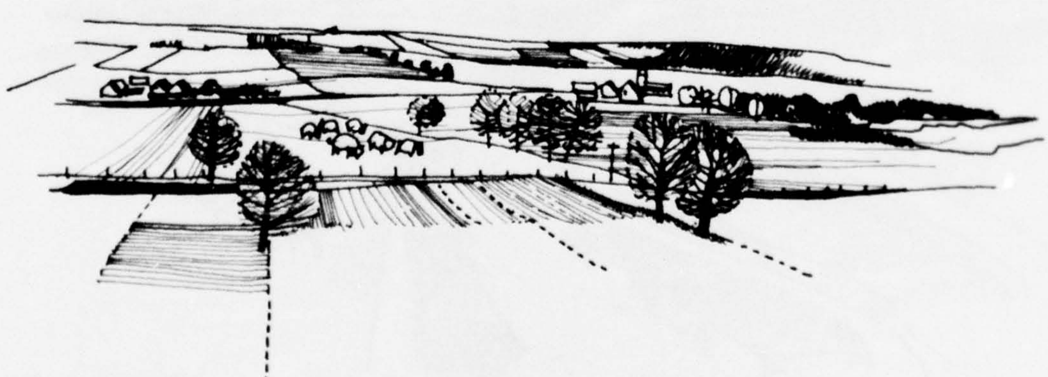


FIGURE N-20

Linear depressions at generally regular intervals with varying amounts of marshland and water

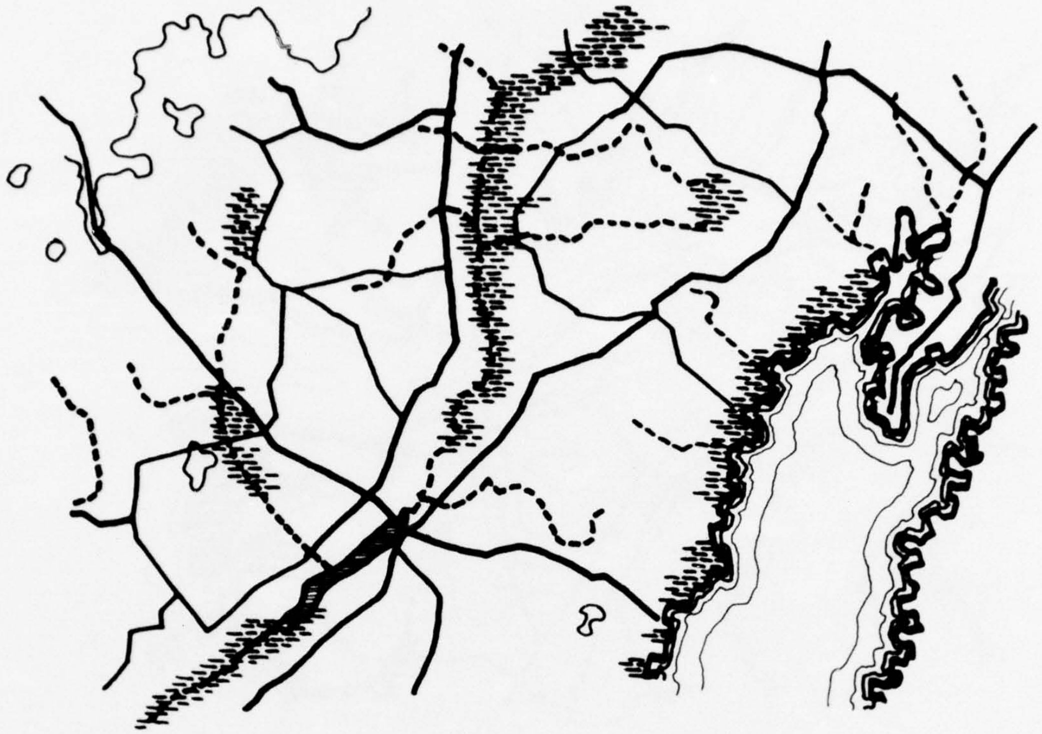
NEW ENGLAND TO NEW YORK UNDULATING LANDS **UL 1**

FIGURE N-21

Random distribution of irregular depressions with deeply penetrating, broad estuaries

MID ATLANTIC UNDULATING LANDS

UL 2



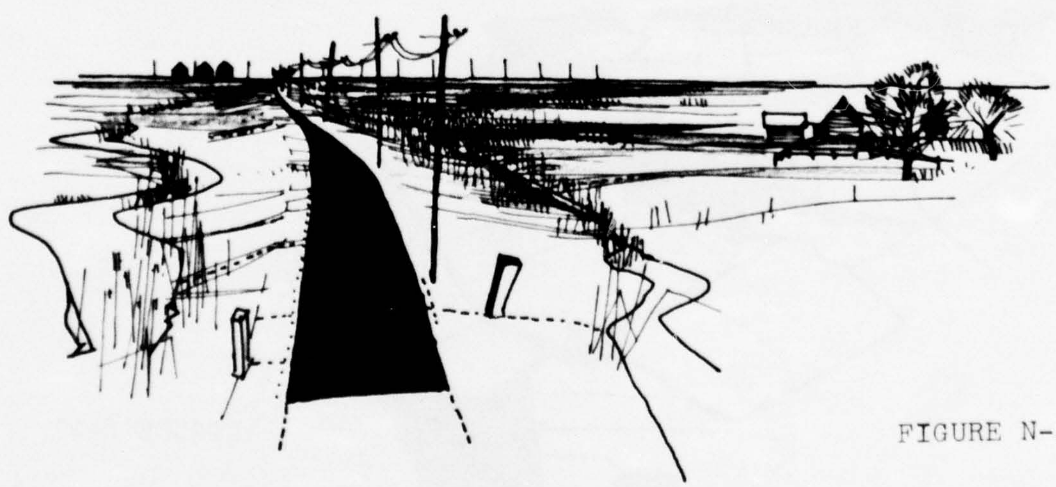


FIGURE N-22

Little or no relief with many marshes and small water bodies

MID ATLANTIC FLAT LANDS

FL 1

FIGURE N-23

Embayed rocky cliffs | **EASTERN MAINE COASTLINE** | **C 1**

FIGURE N-24

Linear rocky shore

CENTRAL NEW
ENGLAND COASTLINE

C 2

FIGURE N-25

Horizontal sand bar
and/or marsh

MID ATLANTIC
COASTLINE

C 3

FIGURE N-26

Sand beach and bluff

SOUTHERN NEW
ENGLAND COASTLINE

C 4

FIGURE N-27

MAP - LANDSCAPE SERIES

(In pocket in back of book)

Landscape Units are sub-divisions that are identified by consistent ground pattern within the Series. Units that have been identified are:

Center City:	Typified by the absolute visual dominance of multi-story structures, extremes in scale and a great variety of buildings. Open spaces including streets are created and defined by structures. Vegetation when it exists is a product of man's manipulation.
Intermediate City:	Typified by a co-dominance of structures and open spaces, mainly streets, and a general horizontal character. Structures range primarily from densely distributed single family dwellings to multi-family, multi-story structures and secondary commercial and small-scale industrial developments.
Fringe City:	Typified by a general dominance of open spaces exemplified by streets and the spaces around individual structures (yards). Structures are basically single family dwellings but include shopping centers, strip developments and industrial parks.
Special Pattern:	Landscapes such as those created by large industrial complexes, harbor and warehouse areas, large areas covered by tank farms, transportation centers such as major airports, and concentrations of heavy industry.
Town-Farm:	Population density ranges from 50 to 500 persons per square mile, towns average 2 to 5 miles apart, 20% to 50% of the land is in open field agriculture and less than 65% of the land is in forest and/or woodland.

Farm:	50% or more of the land is in open field agriculture, less than 50% of the land is in forest and/or woodland, population density varies from less than 50 to 500 persons per square mile and towns range from 2 to more than 5 miles apart.
Farm-Forest:	20 to 35% of the land is in open field agriculture, 65-80% of the land is in forest and/or woodland, population density varies from less than 50 to 500 persons per square mile and towns range from 2 to more than 5 miles apart.
Forest-Town:	65% or more of the land is in forest, towns average 2 to 5 miles apart, population density is from 50 to 500 persons per square mile, and less than 20% of the land is in open field agriculture.
Forest-Wildland:	75% or more of the land is in forest or wildland (scrub, marsh, etc.), population density is less than 50 persons per square mile, towns average more than 5 miles apart and less than 20% of the land is in open field agriculture.

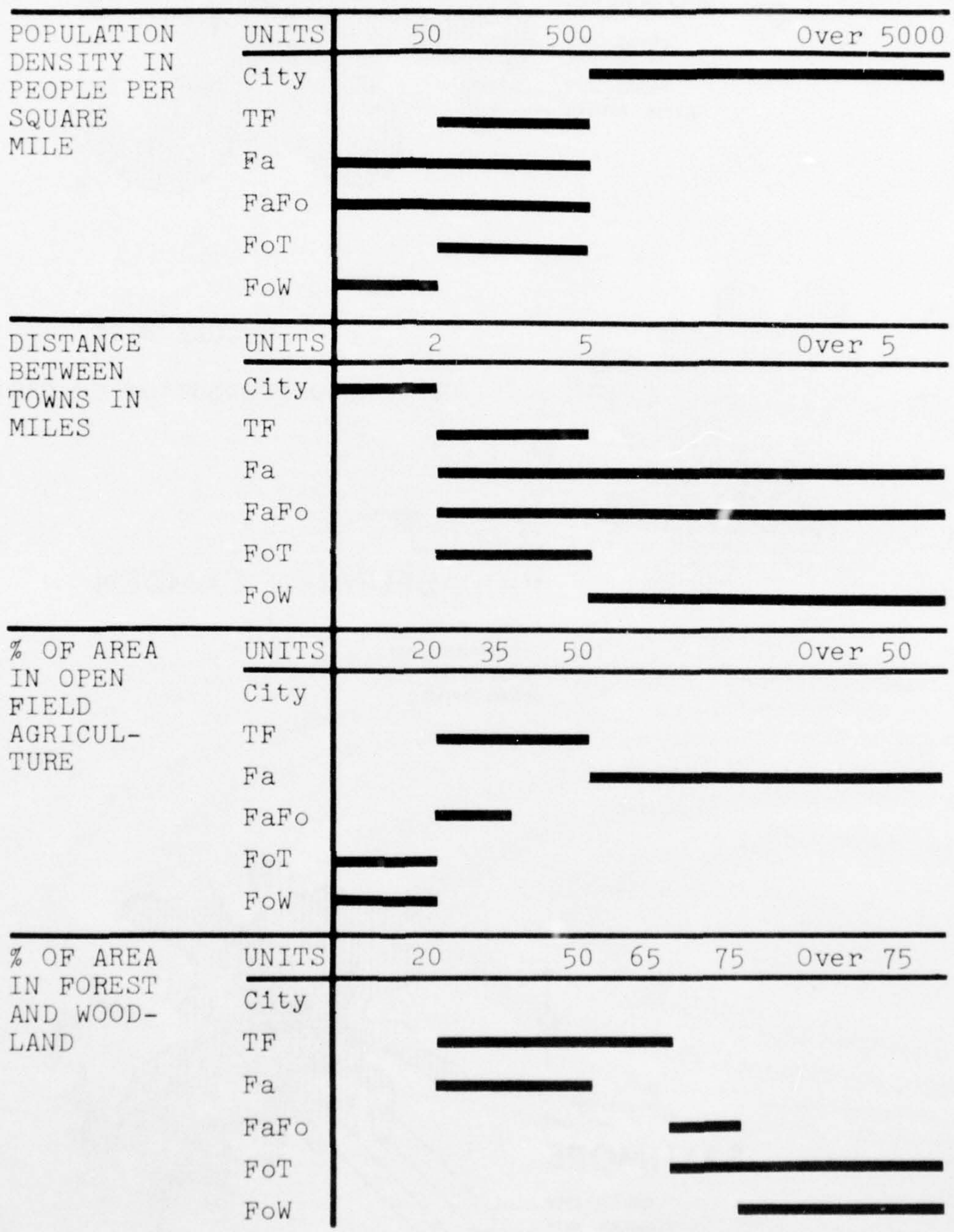
The scale of the NAR project coupled with the scale of the inventory and requisite mapping prohibited the inventorying of Center City and Intermediate City Units. Typical distribution of City Units are indicated in the following diagrams of Boston, Philadelphia-Camden and Baltimore.

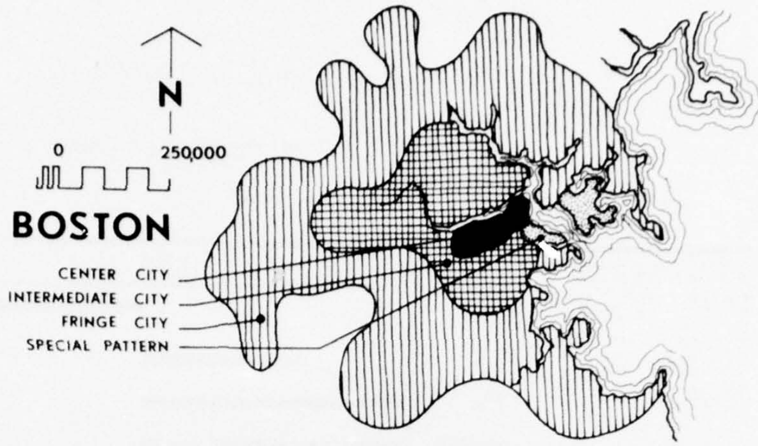
Table N-3 presents a summary of the major pattern generating elements and their magnitude in reference to the five non-city Units and a collective representation of the three city Units. The elements presented in the table are:

1. Population density in people per square mile
2. Distance between towns in miles
3. Percent of area in open field agriculture
4. Percent of area in forest and woodland.

TABLE N-3

LANDSCAPE UNIT DESCRIPTIONS





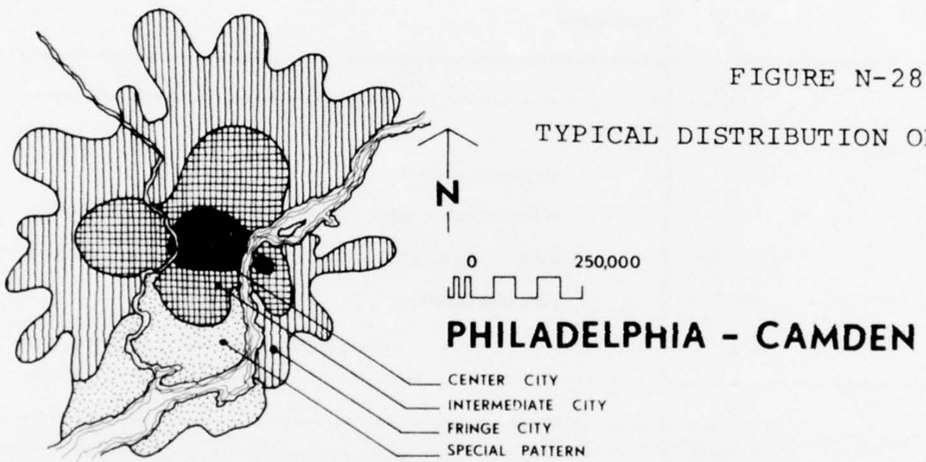
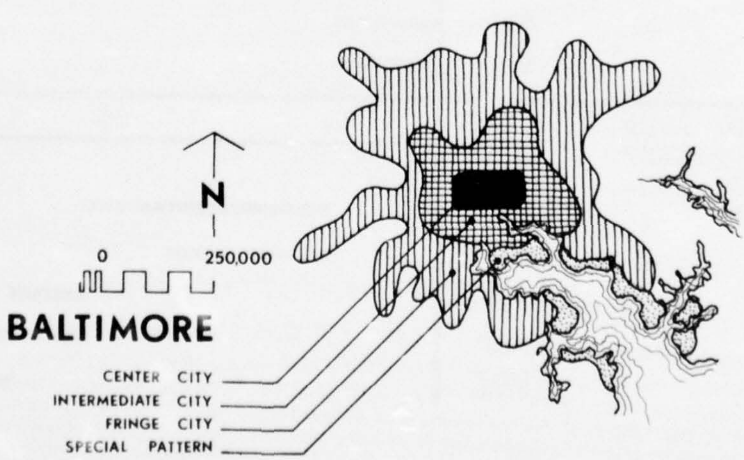


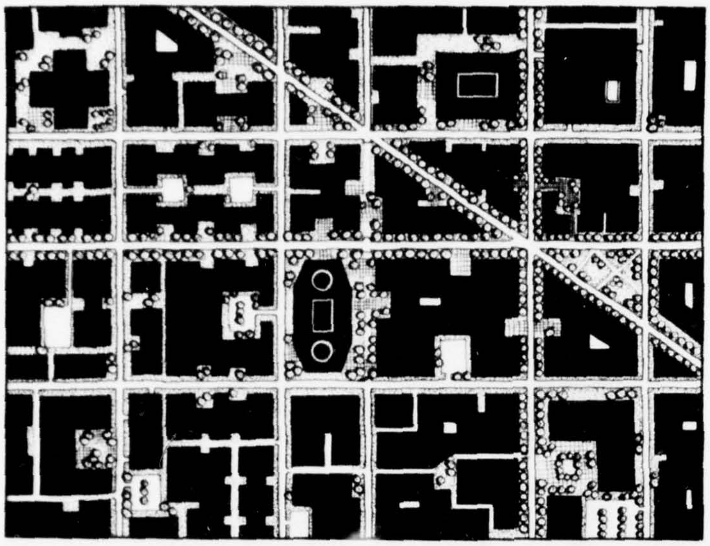
FIGURE N-28

TYPICAL DISTRIBUTION OF CITY UNITS

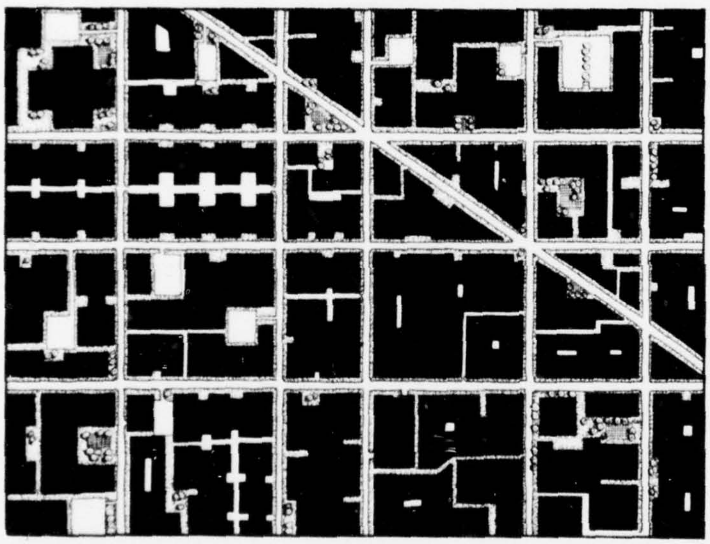


The following illustrations represent hypothetical visual models of the Center City, Intermediate City, Fringe City, Town-Farm, Farm, Farm-Forest, Forest-Town and Forest-Wildland Units. The hypothetical models are based upon a synthesis of existing landscape patterns within the region and upon a subjective evaluation of quality. The quality evaluation of high, medial and low takes into account the number of different elements present (structures, open land, closed land and water), the relative abundance or scarcity of the different elements and their distribution or relationship to each other. These models served, in turn, as the basis for the qualitative evaluation of the Landscape Units.

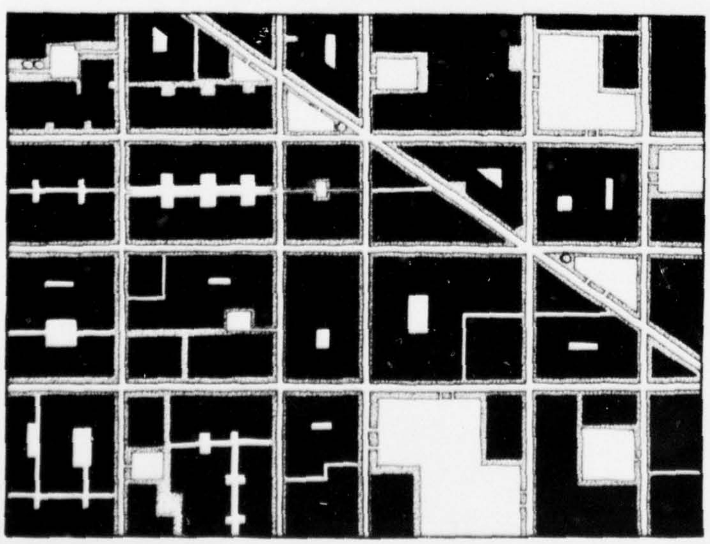
Table N-4 presents a basin tabulation of the inventory data for Series and Units. Measurements of individual Series and Units in each basin have been rounded off to the nearest one hundred square miles. This scale of generalization is used in light of the fact that Units and Series are not defined by boundaries but rather zones of transition.



HIGH



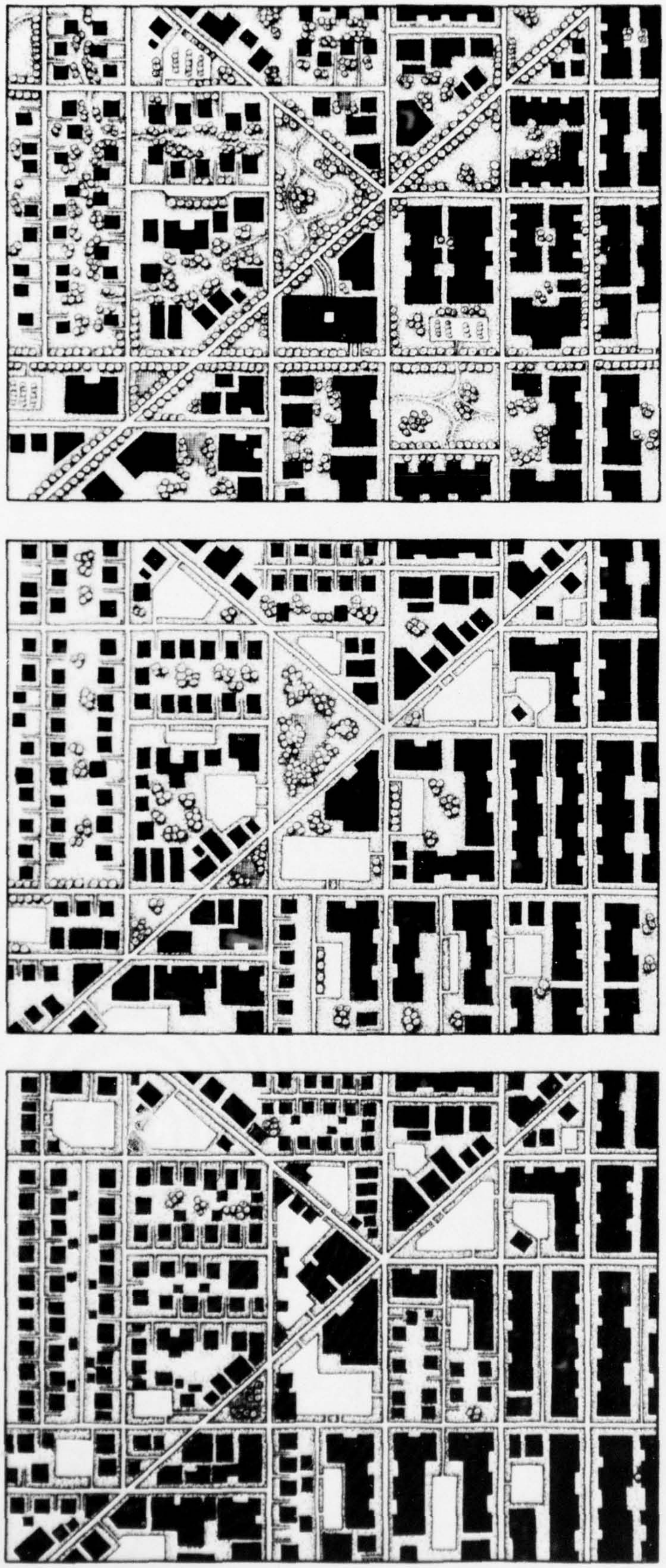
MEDIAL



LOW

FIGURE N-29

CENTER CITY



HIGH

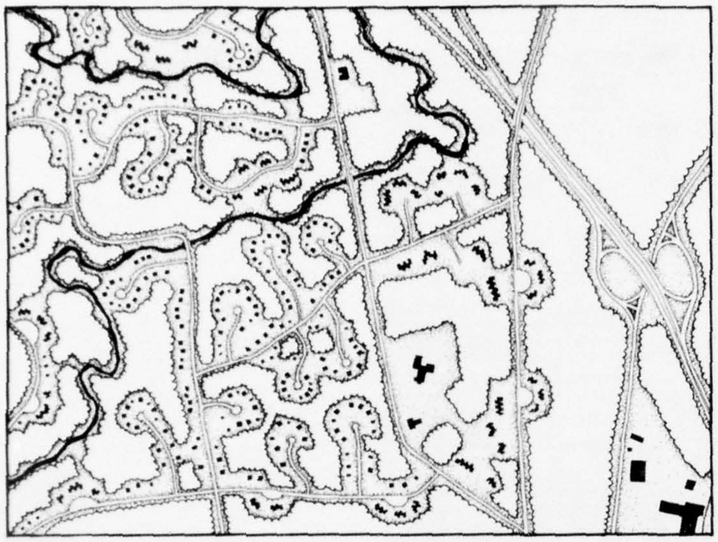
MEDIAL

LOW

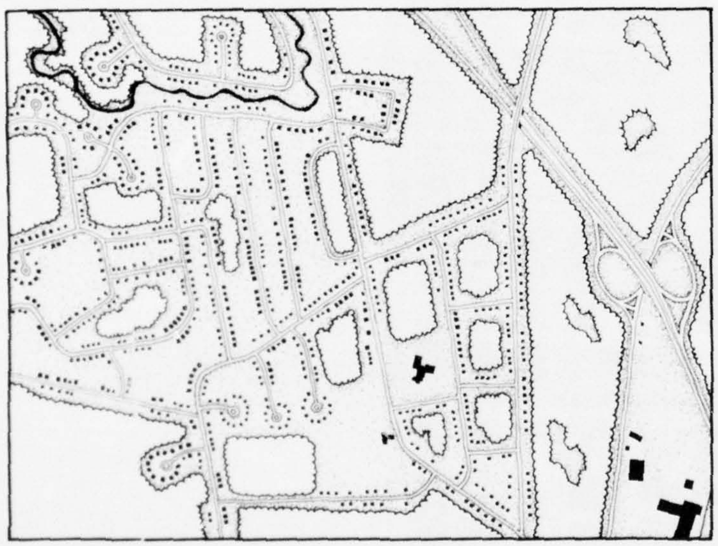
FIGURE N-30

INTERMEDIATE CITY

HIGH



MEDIAL



LOW

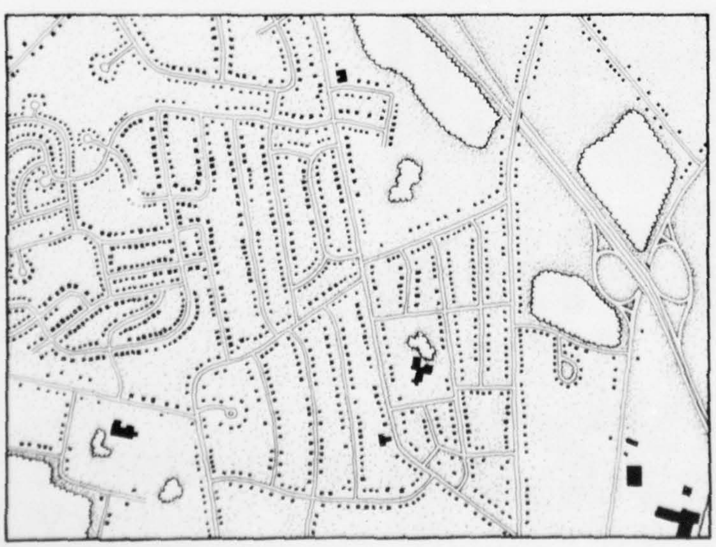
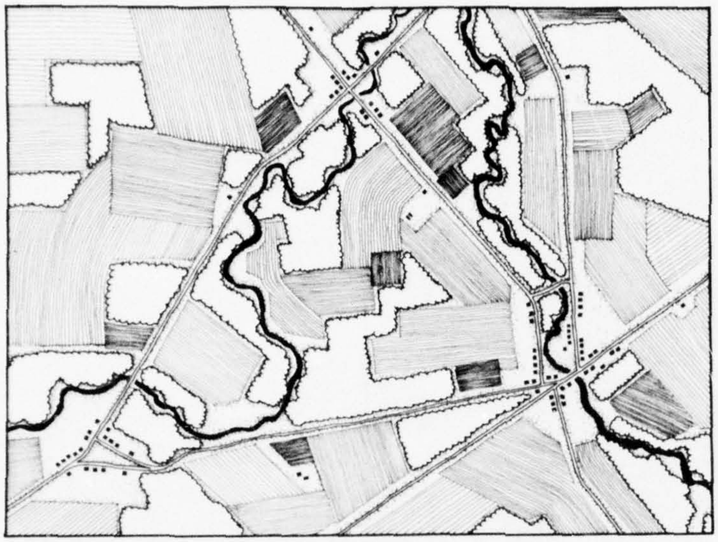


FIGURE N-31

FRINGE CITY

HIGH



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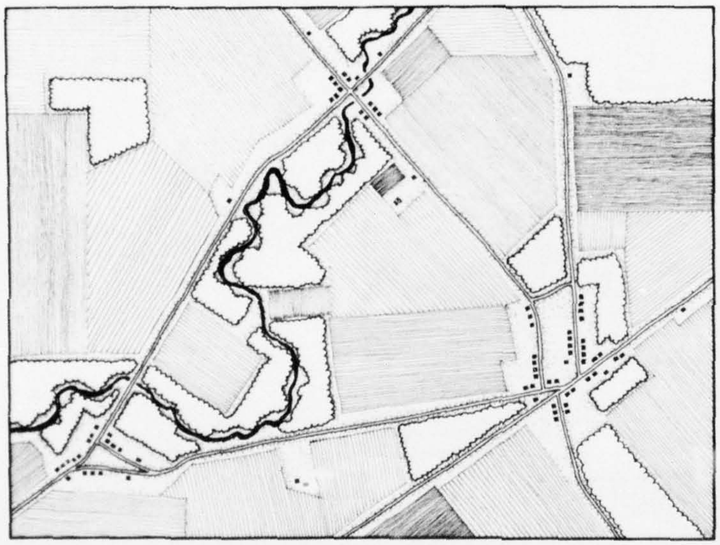


LOW

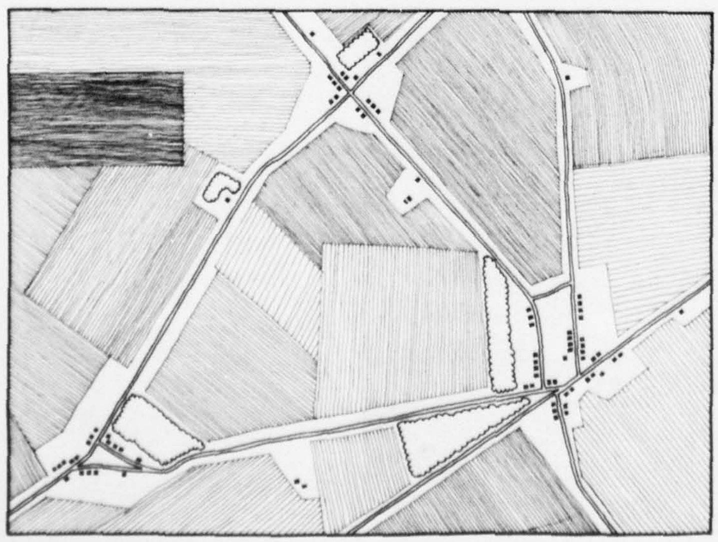
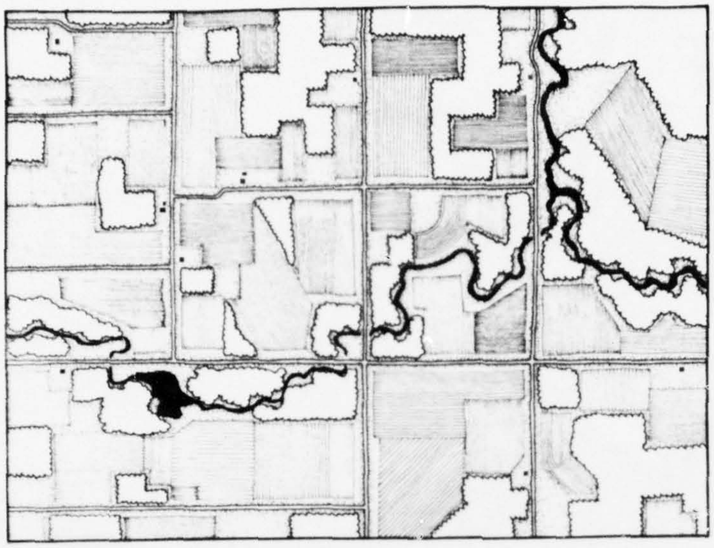
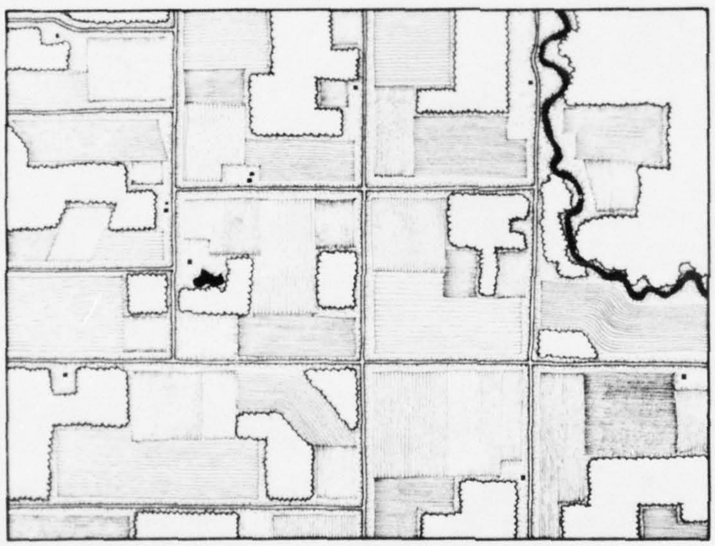


FIGURE N-32

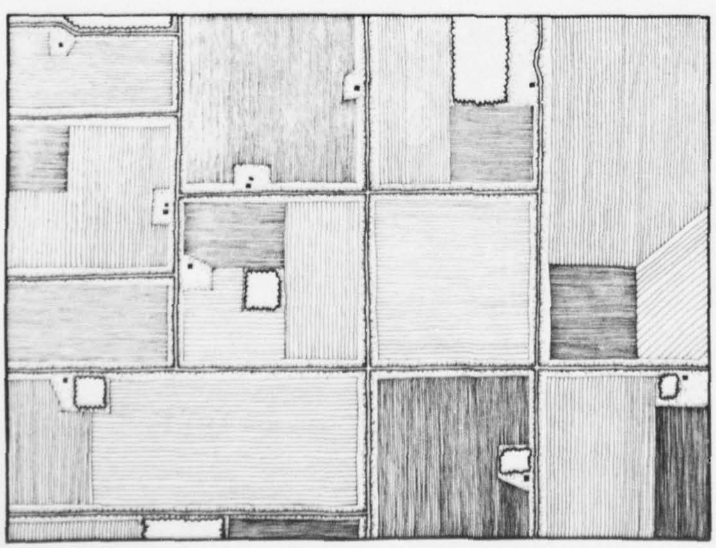
TOWN-FARM



HIGH



MEDIAL



LOW

FIGURE N-33

FARM

HIGH

MEDIAL

LOW

FIGURE N-34

FARM-FOREST

AD-A036 634 RESEARCH PLANNING AND DESIGN ASSOCIATES INC AMHERST MASS F/G 8/6

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY. APPENDIX N. VISU--ETC(U)

MAY 72 J G FABOS, P N PROCOPIO, J H SPENCER

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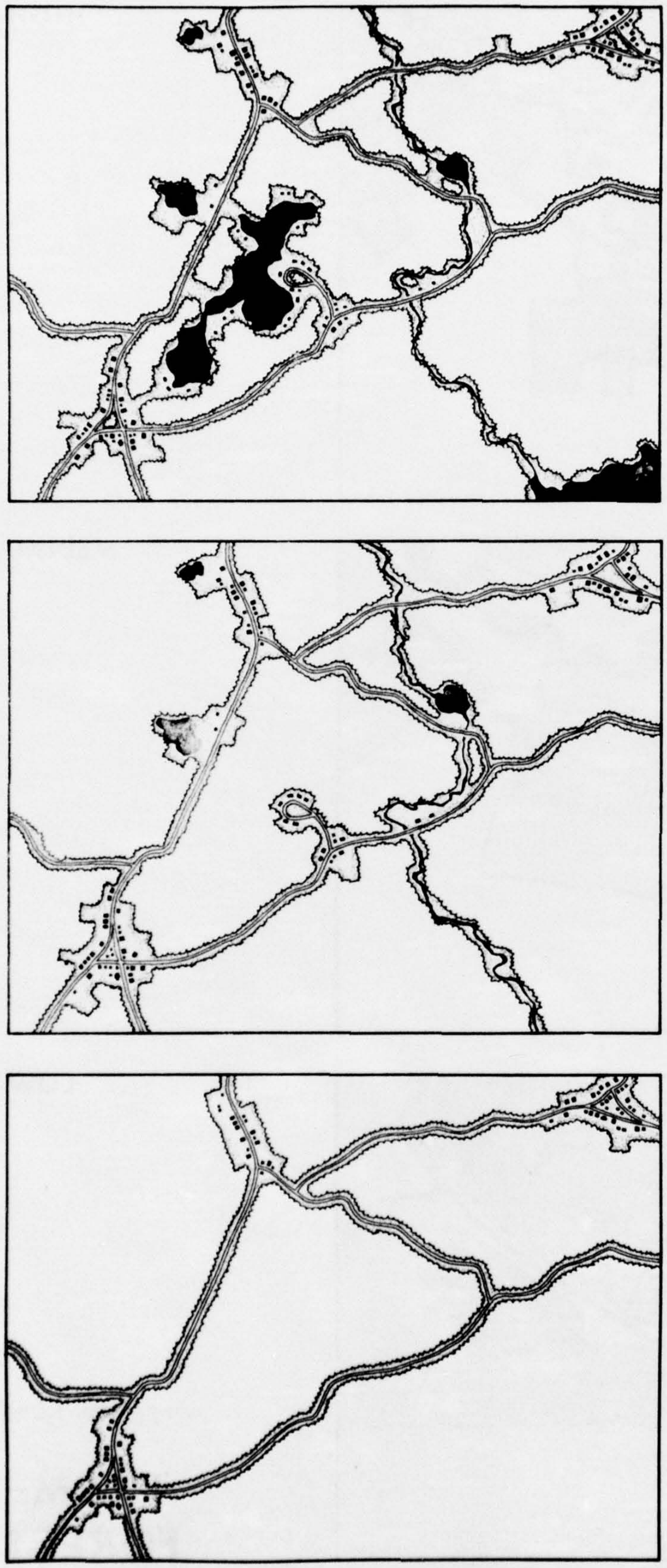


HIGH

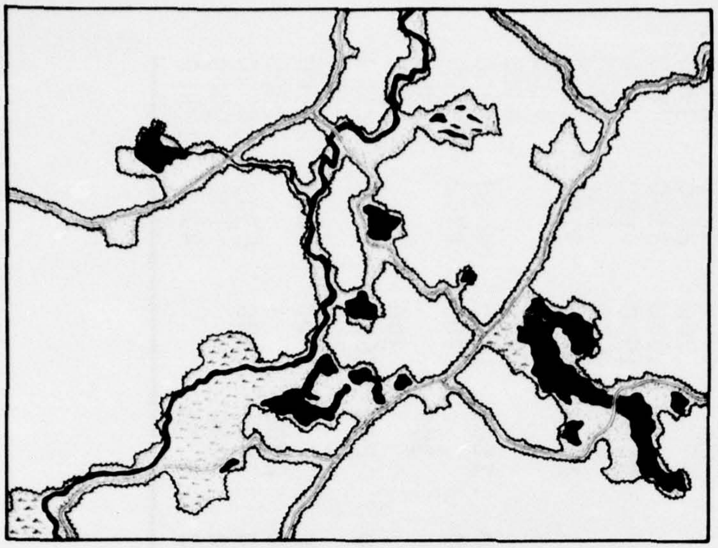
MEDIAL

LOW

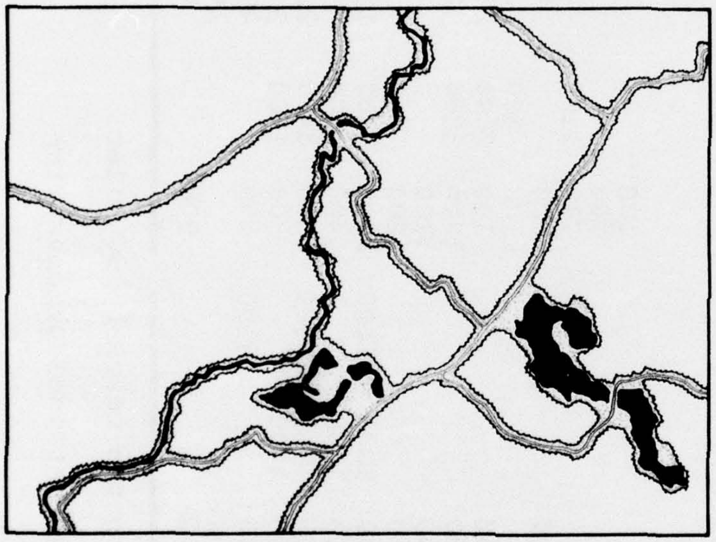
FIGURE N-35

FOREST-TOWN

HIGH



MEDIAL



LOW

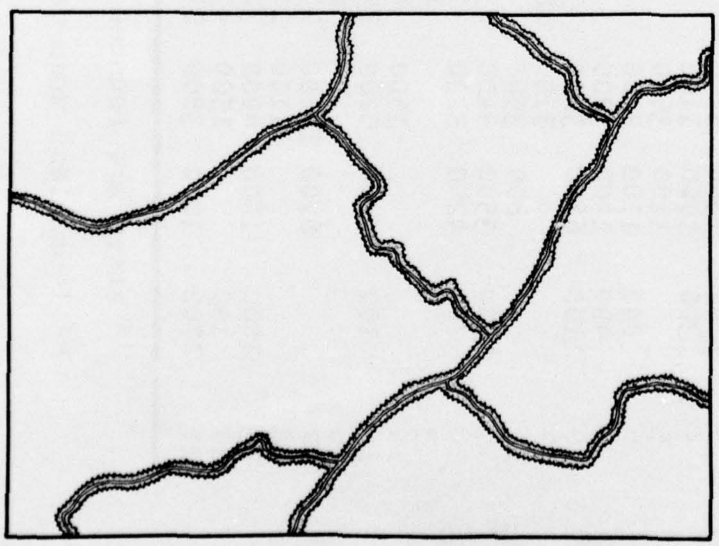


FIGURE N-36

FOREST-WILDLAND

TABLE N-4

LANDSCAPE INVENTORY BY BASIN

	Series*						Unit*						Basin in Sq
Basin	M	SH	RH	UL	FL	X	C	TFa	Fa	FaFo	FoT	FoW	Mi.**
1			7300						1300			6000	7300
2	1100	400	7200								2000	6500	8500
3	1200	1300	3100								2600	3000	5600
4	1300	1000	1100								1000	2400	3400
5		1100	3600								1600	3100	4700
6	800	1100	2100				100			1600	1500	800	4000
7	400	1400	3200				600			500	3500	400	5000
8	1100	6800	3200				700	1100		1700	4500	3100	11100
9			3100	1000			2000				2100		4100
10		800	3500				1100	300			2900		4300
11	1500	3500	4400	2500			100	2600	2400	1800	1000	4000	11900
12	700	4200	5200	3100			1000	3300	3200		700	4700	13200
13				1400			1100			300			1400
14			1500	800			1200	800			300		2300
15	100	900	5200	3900	1200	1200	2600	3100	1900	200	3600	1100	12500
16				600	1500		400	500			1200		2100
17		6700	13000	1300		6500	1300	8400	2200		7400	8200	27500
18			1100	1800	4400		700	1400	2300	2900			7300
19	2800	1200	4200	3200		3100	800		4900	1600	900	6300	14500
20	100		1500	4300					1400	4400		100	5900
21	2700	1200	3800	2700			900		400	5100		4000	10400

* Areas are rounded to the nearest 100 miles

** Total land area does not include coastline

FIGURE N-37

MAP - LANDSCAPE UNITS

(In pocket in back of book)

LANDSCAPE EVALUATION

The evaluation data are presented in both quantitative and qualitative terms. Table N-5 shows the quantitative relationship in square miles and percentages, of Landscape Units to Landscape Series. Table N-6 presents the qualitative evaluation of Sub-Series, Units, and combined landscape evaluation. Center, Intermediate and Fringe City Units are not included in Table N-6. Table N-7 summarizes the qualitative landscape evaluation data.

Almost one-half (46.7%) of the region consists of rolling hills. Mountains, steep hills and rolling hills combined, all of which are visually significant land forms, account for 80% of the total region. While the most dominant of the land forms within the region, the Mountain Series are not spectacular in form and dimension by international or national standards, they do contribute to the diversity of the kind and extent of land forms that exist.

Rolling Hills, being the most ubiquitous Series is the only one in which all Landscape Units are found. The Mountain Series is completely covered by Forest-Wildland. The Steep Hills Series is also predominantly covered with forest image landscape Units. Undulating Land and Flat Land are the only Series having no Forest-Wildland pattern.

The Coastline Series represents one of the most outstanding resources of the region. On the basis of spatial diversity and contrast the coast of Maine obviously is rated high. Comparatively, the remainder of the coast, while an exceptional resource, is evaluated at the medial level.

The data in Table N-5 indicate that about 67% of the region has a dominant forest image. 53% has a very strong forest image (Forest-Town and Forest-Wildland) while 14% (Farm-Forest) includes enough open field agriculture to make the farm image significant also, but still subordinate to the overall forest image.

Farms influence or determine landscape images (Town-Farm, Farm, Farm-Forest) in about 38% of the region. They play a dominant role however in only about 15% (Farm). This is in contrast to forests which dominate visually in 67% of the area.

TABLE N-5 RELATIONSHIP OF UNITS TO SERIES BY AREA IN SQUARE MILES AND PERCENTAGES

	City*	Town-Farm	Farm	Farm-Forest	Forest-Town	Forest-Wildland	Total Series Area and % of NAR
Mountain						13,800 100.0%S/U 26.6%U/S	13,800 8.3%
Steep Hill		1,450** 4.7%S/U 7.6%U/S		2,800 9.2%S/U 12.4%U/S	8,300 27.2%S/U 22.8%U/S	17,950 58.9%S/U 34.4%U/S	30,500 18.3%
Rolling Hill	6,750 8.6%S/U 46.6%U/S	14,200 18.2%S/U 75.0%U/S	15,800 20.3%S/U 70.0%U/S	6,650 8.5%S/U 29.6%U/S	19,400 24.9%S/U 53.5%U/S	15,200 19.5%S/U 29.3%U/S	78,000 46.7%
Compound					5,800 53.6%S/U 15.9%U/S	5,000 46.4%S/U 9.7%U/S	10,800 6.5%
Undulating Land	7,850 29.5%S/U 53.4%U/S	2,200 7.9%S/U 11.6%U/S	5,200 19.6%S/U 23.0%U/S	10,200 38.3%S/U 45.4%U/X	1,150 4.3%S/U 3.2%U/S		26,600 15.9%
Flat Land		1,100 15.1 5.8	1,600 21.9%S/U 7.0%U/S	2,850 39.0%S/U 12.6%U/S	1,750 24.0%S/U 4.8%U/S		7,300 4.3%
Total Unit Area and % of NAR	14,600 8.2%	18,950 11.3%	22,600 13.6%	22,500 13.6%	36,400 22.0%	51,950 31.3%	167,000

*Includes Center, Intermediate and Fringe City Units

**1,450=sq. mi. of Town-Farm Unit in the Steep Hill Series
4.7%S/U=% of series in Town-Farm Unit
7.6%U/S=% of unit in Steep Hill Series

TABLE N-6

LANDSCAPE EVALUATION

SUB-SERIES	SE	UNIT	AREA*	VE	CE
M-1	H	FoW	5,300	M	H
M-2	M	FoW	1,900	M	M
M-3	H	FoW	400	M	H
		FoW	500	L	H
M-4	M	FoW	600	M	M
M-5	M	FoW	5,100	M	M
SH-1	H	FaFo	1,700	M	H
		FoT	5,700	H	H
		FoW	8,500	H	H
SH-2	M	TFa	1,450	H	M
		FaFo	1,100	M	M
		FoT	1,900	H	M
		FoW	950	M	M
SH-3	M	FoW	7,000	M	M
SH-4	M	FoT	700	M	M
		FoW	1,500	M	M
RH-1	H	Fa	1,[illegible]00	L	M
		FaFo	2,100	H	H
		FoT	4,000	M	H
		FoT	7,050	H	H
		FoW	9,100	L	M
		FoW	6,100	H	H
RH-2	M	TFa	2,950	M	M
		TFa	200	H	H
		FoT	8,350	M	M

SUB-SERIES	SE	UNIT	AREA*	VE	CE
RH-3	M	Fa	2,500	L	L
RH-4	L	Tfa	11,050	M	L
		FoW	1,000	M	L
RH-5	L	TFa	7,800	M	L
RH-6	L	Fa	250	L	L
		Fa	3,850	M	L
		FaFo	3,050	L	L
		FaFo	1,500	L	L
X-1	M	FoT	5,800	M	M
		FoW	5,000	M	M
UL-1	L	TFa	2,800	M	M
		Fa	2,450	M	M
		FoT	1,150	M	M
UL-2	M	TFa	1,100	L	L
		TFa	1,100	M	M
		Fa	2,750	M	M
		FaFo	600	L	L
		FaFo	9,600	M	M
FL-1	M	TFa	1,100	M	M
		Fa	1,600	M	M
		FaFo	2,850	M	M
		FoT	1,750	L	L
C-1	H		2200		H
C-2	M		490		M
C-3	M		3820		M
C-4	M		790		M

*area in square miles except coastline in linear miles

SE: Sub-series evaluation
VE: Unit evaluation
CE: Combined evaluation

H: High
M: Medial
L: Low

TFa Town-Farm
Fa Farm
FaFo Farm-Forest
FoT Forest-Town
FoW Forest-Wildland

NOTE: Coastline measurements based on data from ORRRC Study Report #4, 1962, p 12

TABLE N-7: LANDSCAPE EVALUATION SUMMARY

Series:	High Area	High %	Medial Area	Medial %	Low Area	Low %
Mountains	6,200	45.0	7,600	55.0		
Steep Hills	15,900	52.1	14,600	47.9		
Rolling Hills	29,750	38.1	19,750	25.3	28,500	36.6
Compound			10,800	100.0		
Undulating Land			20,200	76.0	6,400	24.0
Flat Land			7,300	100.0		
Coastline	2,200	30.1	5,100	69.9		
Series Total	51,850	31.0	80,250	48.0	34,900	21.0
Units:						
Town-Farm	1,650	8.7	16,200	85.5	1,100	5.8
Farm			19,350	85.5	3,250	14.5
Farm-Forest	2,100	9.3	16,750	74.5	3,650	16.2
Forest-Town	14,650	40.2	20,000	55.0	1,750	4.8
Forest-Wildland	14,600	28.1	27,750	53.4	9,600	18.5
Units Total*	33,000	21.7	100,050	65.6	19,350	12.7
Combined Value*	41,550	27.3	77,400	50.8	33,450	21.9

*Does not include 14,600 square miles of city Units

Cities including urban and suburban areas and towns influence the landscape image significantly over about one-third of the region. One-fourth of the region is a landscape of towns and farms or towns and forests. The latter are frequently coincidental with regional rural vacation centers.

Landscapes which were ranked high (combined value) in Table N-6 were from the aforementioned 80% of the area which constitutes the significant land form within the region. Low-ranked landscapes are distributed throughout Rolling Hills and Undulating Land with a very minor amount in Flat Land.

The Landscape Units which had the greatest percentage evaluated high were Forest-Town (40.2%) and Forest-Wildland (28.1%). These Units include essentially all of the major inland recreation areas in the region; the lake area of Maine, the Lake Winnepesaukee district in New Hampshire, the Poconos in New York and part of the Blue Ridge in Virginia. They all fall within the Forest-Town Unit. Often major vacation and recreation areas such as the White, Green and Adirondack Mountains fall within the Forest-Wildlands pattern. The latter pattern also has the single largest percentage of area evaluated low. Continuous forest landscape, uninterrupted by town, lake, bog or river can indeed be monotonous.

Composite Landscapes: The geographic distribution of different landscapes, both quantitatively and qualitatively is an important additional dimension in the regional evaluation. First is the consideration of the juxtaposition of different landscapes or the contrast between landscapes. This is visual diversity created between landscapes rather than within a landscape. The diversity between landscapes is created, for example, by three contiguous landscape images such as Forest-Wildland, Farm and Forest-Town. Within a landscape, diversity is created by the relationship of elements such as land form, vegetation, structures and water.

The adage that "the whole is greater than the sum of its parts" is most apt in reference to the juxtaposition of different landscape images. Tables N-5, N-6 and N-7, and the map of landscape quality relate to the evaluation within the boundaries of Series and Units. Table N-8 lists composite quality landscape areas; those areas which because of the juxtaposition of different landscapes are equally significant.

All of the areas listed in Table N-8 have several characteristics in common. They all encompass a range of three Landscape Series and three Landscape Units within a fifty mile diameter circle representing a time dimension of about one hour (driving time). Also all of the areas contain at least one of the farm image Units. Open land, land not covered by trees, is an essential pattern creating element. Open land also provides the opportunities for views to the hills and mountains which are not available across the covered lands. The juxtaposition of different land forms and different patterns which, while not of high quality on the basis of individual components, create composite landscapes of diversity and high quality.

TABLE N-8: COMPOSITE QUALITY LANDSCAPES

	LOCATION	AREA	EVALUATION FACTOR
1.	Lake Winnepesaukee, N.H.	1200 sq.mi.	Juxtaposition of Forest-Wildland, Forest-Town and Farm-Forest Units.
2.	Connecticut River, Southern Vt. and Massachusetts	800 sq.mi.	Juxtaposition of Town-Farm, Forest-Town and Forest-Wildland Units.
3.	Lake Champlain Valley-Vermont and New York	4400 sq.mi.	Juxtaposition of Farm, Town-Farm, and Forest Wildland Units.
4.	Northern Adiron-dack Area - New York	1200 sq.mi.	Juxtaposition of Town-Farm, Forest-Town and Forest-Wildland Units
5.	Mohawk River Valley New York	2400 sq.mi.	Juxtaposition of Farm, Town-Farm and Forest-Wildland Units.
6.	Southern Catskill-Poconos Area - NY, NJ, and Pa.	2400 sq.mi.	Juxtaposition of Farm, Town-Farm & Forest-Wildland Units
7.	Great Valley-Blue Ridge Mt. Area-Va. & W.Va.	8000 sq.mi.	Juxtaposition of Farm, Forest-Town and Forest-Wildland Units.
8.	Coastline - Maine to Va.		Juxtaposition of the land-water edge with varying Series and Units.

The coastline, for essentially its entire length also falls within the concept of the composite landscapes. The very sharp edge which is created by the coming together of land and water combined with the immediately adjacent Landscape Series (which range from Steep Hills in Maine to Flat Land in Virginia) and Landscape Units (all Units are found adjacent to the coastline) creates composite landscapes which are almost universally recognized as of high quality. Within this Series however (more so than any others) is to be found the greatest number of landscape misfits - products of insensitive development of coastlines in and around all major cities.

Metropolitan Areas: A second factor, and one of major importance, in the consideration of the geographical distribution of Landscape Series and Units is the relationship of quality landscapes to the major population centers of the NAR. Major population centers were identified as:

1. Boston-Providence Metropolitan Area
2. New York Metropolitan Area
3. Philadelphia Metropolitan Area
4. Baltimore-Washington, D.C. Metropolitan Area

Table N-9 shows the relationship of composite landscapes and of quality to the metropolitan areas. The relationships are based upon a time-distance scale of driving time. Two time periods are indicated: within one hour driving time and within two and one-half hours driving time. The time-distance zones are based on the assumption of the starting point being in the centers of the Metropolitan Areas.

None of the metropolitan areas are within one hour's driving time of landscapes that have been evaluated high. All except the Boston-Providence area include substantial sections evaluated low. The only composite landscape within the one hour time zone is the coastline. Most often however, this is the section of the coastline containing the greatest percentage of landscape misfits.

Within a two and one-half hour time zone all metropolitan areas encompass greater landscape diversity. In addition to the Center City Units they all include at least three additional Units and at least three Series.

The New York, Philadelphia and Baltimore-Washington,D.C. areas include at least four Units and four Series each, However, none of these three areas include landscapes evaluated as high. The Boston-Providence Area includes a small area so ranked. The larger time-distance scale does include at least one composite landscape in addition to the coastline for each metropolitan area.

TABLE N-9

RELATIONSHIP OF METROPOLITAN AREAS TO QUALITY LANDSCAPES

	BOSTON-PROVIDENCE	NEW YORK	PHILADELPHIA	BALTIMORE-WASHINGTON, D.C.
WITHIN 1 HOUR DRIVING TIME				
Accessible Area	5,500 sq. mi.	4,600 sq. mi.	5,500 sq. mi.	5,700 sq. mi.
Units in area*	FoT	TFa,FoT	TFa,Fa,FaFo	Fa,Fa-Fo
Series in area	RH,UL	RH,UL	RH,UL,FL	RH,UL
Range of combined values	Medial	Low to Medial	Low to Medial	Low to Medial
Composite Landscape in area	coastline	coastline	coastline	coastline
WITHIN 2½ HOURS DRIVING TIME				
Accessible Area	14,300 sq.mi.	16,000 sq.mi.	19,300 sq.mi.	26,600 sq.mi.
Units in Area*	TFa,FaFo,FoT	TFa,Fa,FaFo, FoT,FoW	TFa,Fa,FaFo FoT	TFa,Fa,FaFo FoT,FoW
Series in Area	SH,RH,UL	X,RH,UL,FL	X,RH,UL,FL	M,SH,RH,UL,FL
Range of combined values	Medial to High	Low to Medial	Low to Medial	Low to Medial
Composite Landscape in region	Connecticut River, Coastline, Lake Winnipesaukee area	Coastline, Southern Catskills-Poconos area	Coastline, Southern Catskills-Poconos area	Coastline, Great Valley-Blue Ridge Mountain area

*In addition to Center, Intermediate and Fringe City Units.

FIGURE N-38

MAP - LANDSCAPE QUALITY

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SECTION IV: NEEDS, PLANNING AND MANAGEMENT

INTRODUCTION

The following visual and cultural needs are discussed in reference to the three approaches to landscape planning and management presented in Section II; preservation, protection and development. Preservation and protection relate to existing landscape resources which provide opportunities for unique or quality cultural experiences in the use of the resource. The uses can range from backpacking in a wilderness area to investigating the habitat of rare or endangered species or to providing sites for homes and communities. The need then is to provide the opportunities for these diverse uses without a concommitant reduction in the quality of the experience or the resource.

The differences between preservation and protection are partly of degree. To a certain extent they are overlapping concepts. Preservation ranges from the attempt to maintain the status quo, such as in a natural area, from which all of man's activities are excluded except for that of the researchers, to the desire to preserve the quality of an area but allowing limited controlled use compatible with the maintenance of that quality such as in a wilderness area.

Protection is intended as an approach which accomodates more intensive use but constrains both the kind and the intensity of use on the basis of the quality and the quantity of the resource base. While preservation precludes changes in use, protection accomodates changes in use as long as the new uses do not lower the landscape quality. For example, a Forest-Wildland Unit under the preservation concept is envisioned as remaining as is. If logging is currently practiced, it would continue subject to certain controls intended to preserve the existing quality. If however, another Forest-Wildland Unit were delineated under the protection concept the use might change to accomodate second-home developments. But, this change should not be one that reduces the visual quality of the landscape. Land use controls which protect steep slopes, drainage ways and ridge lines and which limit densities to those compatible with the maintenance of existing quality are an essential concommitant of protection in this example.

Preservation and protection can conceivably be applicable to the same general landscape. For example, National Park Service management programs in many parks

and monuments frequently encompass both concepts. It may be that the only way to preserve an area from the immense pressures of numbers of people or from change of the entire area to some other economic activity, is to direct the change in specific places under controls which preserve the quality of the land-scape while accommodating the desired change.

Development is intended as an approach which ameliorates misfits, serves as a positive force in improving the quality of the visual landscape and increases the range of opportunities for use in both qualitative and quantitative terms.

THE PRESERVATION OF UNIQUE NATURAL AND CULTURAL LANDSCAPES

The need for the preservation of unique resources has been approached on two levels; unique landscape resource areas and unique sites. Unique landscape resource areas include wilderness quality areas, the Coastline and Mountain Series. These represent areas unique in quality and quantity. Major representative areas, in terms of scale, which are already preserved are indicated on the needs map. They include:

Wilderness Quality	- Allagash Wilderness Waterway
	- Great Gulf Wilderness Area
Coastline	- Acadia National Park
	- Fire Island National Seashore
	- Cape Cod National Seashore
	- Assateague Island National Seashore
Mountain Areas	- Baxter State Park
	- Green Mountain National Forest
	- Adirondack Forest Preserve
	- Shenandoah National Park
	- Blue Ridge Parkway
	- George Washington National Forest
	- White Mountain National Forest

<u>Wilderness Quality</u>: The only area in the NAR that is over five hours driving time from a major metropolitan area and that is essentially devoid of intensive development is the Rolling Hill, Forest-Wildland areas of northeast of the Mississippi is the Everglades National park of Florida. This quality of northern Maine should be preserved in conjunction with the Allagash Wilderness Waterway as a unique landscape resource on the Eastern Seaboard. Preservation in this sense is meant to include accepted resource management practices such as logging around specific areas like the Allagash which are

maintained in as "wild" and "natural" a state as possible. These resource management practices, however, must be controlled so as to not impinge upon or diminish the wilderness quality of selected areas. The practices can, in fact, complement the wilderness areas by providing a zone of compatible activity around the wilderness area if they are thoughtfully and carefully carried out in both location and method.

Unique Vegetation Areas: This area in northern Maine also contains one of the two Spruce-Fir communities in the region, the second being on the high peaks of the Appalachians. These communities were never abundant and the area in Maine holds the only significant stands of mature Spruce and Fir forest in the region. Given the original scarcity of this forest type it is especially important to protect the few remaining sites containing samples of the Spruce-Fir formations.

The area designated in New Jersey holds remnants of Pitch Pine-Oak forest that are unique to all of North America. Originally, this forest type was the most restricted in its range of all the plant communities in the NAR. The existence of a few virgin stands in the New Jersey pine barrens is of special scientific and cultural interest and warrants preservation.

Coastline: Significant sections of each Coastline Sub-Series should also be preserved with emphasis on the Mid-Atlantic and the Eastern Maine Sub-Series. The Eastern Maine Coastline is an exceptional visual landscape resource, a rocky, embayed shoreline, almost all of which is beyond two and one-half hours driving time of a major metropolitan area. The Mid-Atlantic Coastline includes several of the major migratory waterfowl habitat areas including Long Island Sound and adjacent waters, Delaware Bay, Chesapeake Bay and the South East Coastal Zone of New Jersey. The estuarine areas from New Jersey south are nesting areas for the Southern Bald Eagle (an endangered species) and the estuaries in general provide the most productive aquatic habitats in terms of the quantities of fish resources that can be supported.

The greatest emphasis on the preservation of additional shoreline in its natural or near natural state should be directed to the Eastern Maine and the Mid-Atlantic Coastline beyond the two and one-half hour driving time zone. These are areas with very high visual quality or that have natural area significance and a low threshold of tolerance of human activity.

Sites for Preservation: Section VI of this report includes a listing of specific existing and potential sites for preservation arranged by individual basins. These are presented as generally distinct from the previously discussed general areas. These sites are not shown on the Needs Map.

THE PROTECTION OF LANDSCAPE QUALITY

Approximately 41,550 square miles or 24.9 percent of the NAR landscape has been evaluated as of high quality within individual Unit Sub-Series combinations such as a Forest-Wildland Unit in the Northern Steep Hills Sub-Series. All of these landscapes are beyond the one hour time-distance zones of all major metropolitan areas. Only the Boston area is within the two and one-half hour zone.

Lake Landscapes: The predominant Units within these landscapes are Forest-Wildland, Forest-Town and Farm-Forest. The prime factor influencing visual quality in the first two Units is the presence of water bodies in sufficient quantity (6 to 9 percent of the surface area of the Unit) to serve as pattern generating elements in Maine and New Hampshire. These are the major areas in the NAR, other than the coastline, where water plays a dominant role in influencing pattern and quality. The potential for second home developments around these ponds and lakes is great. Consequently the potential for significant diminution of visual quality is great. Land use controls addressed to the problems of lake front development and the guaranteeing of adequate public access to the water bodies both visually and physically is essential.

Hillside Farm Landscapes: The prime factor influencing visual quality in the Farm-Forest Units on the steep hills of Vermont and New Hampshire are the open lands of the valley floor and hillside farms. The quality is a product of the superimposition of this strong pattern on contrasting landform. The maintenance of the quality at a high level is strongly dependent upon the maintenance of the open farm fields and the protection of both the valley floors and the ridge lines from strip development. Strip development along the highways which run through the valleys, destroys the Farm-Forest image and creates in its place a continuous town image. Strip development of cottages and houses along the ridgelines also destroys the sense of continuity of forest cover from one valley or ridge to the next. It places man-made structures in a position of visual dominance to the detriment of the landscape quality.

Historic Sites: Specific historic sites for preservation, both those already preserved and potential sites, are included in the basin summaries in Section VI. Most frequently in the past however, consideration of the historic site did not extend beyond the property lines which circumscribed the structure, building or land of immediate concern. For the maximum benefit of the user (visitor) the historic site should exist within an environmental context that is compatible with and reinforces the values of the site itself. Thus, each site should be carefully studied and criteria established for defining a surrounding zone of compatible environment. If the existing surrounding land use is incompatible, the desired environment should be reclaimed or constructed. For example, the protection of a block in each direction around an historic building in a town could make a suitable environmental buffer zone.

THE PROTECTION OF COMPOSITE LANDSCAPES

Composite landscapes are listed in Table N-8 include:

- Lake Winnipesaukee Area, New Hampshire
- Connecticut River Valley, Southern Vermont and Massachusetts
- Lake Champlain Valley, Vermont and New York
- Northern Adirondack Area, New York
- Mohawk River Valley, New York
- Southern Catskill-Poconos Area, New York, New Jersey and Pennsylvania
- Great Valley-Blue Ridge Mountain Area, Virginia, West Virginia and Pennsylvania
- Coastline, Maine to Virginia

These composite landscapes, excluding the coastline, cover approximately 20,400 square miles or about twelve percent of the NAR. They are also the major quality landscape resources available to the metropolitan centers within the two and one-half hour time-distance zone. The coastline is the only composite landscape within one hour's driving time of any of the four major metropolitan centers.

While diversity exists at a smaller scale within the landscape such as the variety of towns, fields and woodlots within a Town-Farm Unit, these composite landscapes, about twelve percent of the region, represent a larger scale of diversity. They are representative, both inland and coastal, of the best of the regional image. They also display a range of lifestyles in close juxtaposition to each other, from fishing village and resort areas to dairy farms and forestry.

Coastline: All major portions (with the exception of the Cape Cod National Seashore) of the central New England and Southern New England Coastlines are developed and opportunities to preserve major sections are limited, if not nonexistent. Opportunities still exist, however, for additional public acquisition and for the protection of the special visual qualities and cultural opportunities afforded by the coastline within the one to two and one half hour time-distance zones. The National Park Service in the report Our Vanishing Shoreline, 1954, recommended that fifteen percent of the general shoreline of the Atlantic and Gulf coasts be acquired for public recreation purposes to be administered by Federal, state and local agencies. At the time of that report, only six and one-half percent of the Atlantic and Gulf coasts were in Federal and state ownership. More than half of this area was in Cape Hatteras National Seashore, Acadia National Park and Everglades National Park - only Acadia is within the NAR. The Outdoor Recreation Resources Review Commission reported in 1962 that of the approximately 7300 miles of shoreline in the NAR, only 343 (less than .5%) were in public ownership. Of those 343 miles, 179 were restricted to use for various reasons such as inclusion in military installations. Since 1962, the major public shoreline additions within the NAR have been in Cape Cod, Fire Island and Assateague Island National Seashores. These three National Seashores total 112 miles of coastline. Of this total however, 53 miles was already in public ownership prior to the creation of the seashores. Only 59 miles were added to the public domain. The gap between what is in public ownership and the fifteen percent proposed in 1954 is enormous. This need coupled with the preservation of unique coastlines is directed to closing that gap.

Farm Landscapes: A key ingredient of the Lake Champlain Valley, Mohawk River Valley, Southern Poconos-Catskill area and the Great Valley-Blue Ridge Mountain area is the farm landscape occupying the linear valley floors. These major agricultural valleys account for approximately 5.3 percent of the total area. They are essential to the maintenance of the of the landscape diversity. Protection of these landscapes is dependent upon the maintenance of the open fields of the Farm Units which contrast with the tree-covered lands of the adjacent Forest-Town and Forest-Wildland Units.

Vacation Landscapes: The Lake Winnipesaukee and Northern Adirondack areas are both popular vacation areas consisting of farm areas, towns, lakes and forests juxtaposed to mountains, steep hills and rolling hills. This provides a very diverse mix of pattern and land form. Hence, it is difficult to isolate a key factor in the discussion of the protection of the landscapes. Prevention of strip development along the roads and the encouragement of the clustering of structures, the maintaining of open lands in the lower areas for vistas and views and the protection of the shorelines of the lakes and rivers (wherever it is still possible) from continuous strip development are essential ingredients in the protection of these landscapes.

New England Town and Farm: The Connecticut River Valley in Southern Vermont and New Hampshire and in Northern Massachusetts is a landscape of diversity similar to the previously discussed vacation landscapes. The lakes are, however, replaced by the river as the dominant water feature and farms are somewhat more prevalent. Towns are typical of New England, many of them exuding the "picture post card" image of the town common surrounded by stately homes focusing on the church with the white steeple. Major protection needs include the prevention of strip development along roads and waterways and the maintenance of the open land.

THE DEVELOPMENT OF LANDSCAPE QUALITY

A large portion of the NAR landscape is of medial or low quality because it possesses little variety in the scale and distribution of open land (including lakes and wetlands), forest and population centers. These areas lack diversity within a given landscape unit. Perhaps the most vivid example, but by no means the only one, is the continual spread of suburbia on one-quarter or one-half acre lots, without the interruption of farm land or forest, across thousands of acres. Farm landscapes and forests can be similarly homogeneous and monotonous. A forest uninterrupted by marsh, lake or village, located on land form with little contrast or spatial complexity, can be as visually monotonous as endless suburbia. Farm landscapes consisting of uniform-sized fields uniformly distributed on rolling, undulating or flat land and all devoted to raising the same crop also create a landscape lacking in diversity.

The Regional Plan Association in the NAR Report, Study of Present and Projected Urban Development and Land

Use in North Atlantic Region, 1969, has projected a "most likely distribution alternative" pattern of future urban development. In this most likely pattern a 93.7 percent increase in population and 112.5 percent increase in developed land between 1960 and 2020 is expected. The greatest growth is expected around cities of 75,000 to 250,00 population with a greater suburbanization of the population. Thus, the development of landscape quality to accomodate this expected development is important within the immediate environs of essentially all urban areas. Immediate environs of major metropolitan areas are considered to be 30 miles beyond present boundaries. The immediate environs of other urban areas are considered to be ten miles beyond present boundaries.

Increase Landscape Absorbtive Capacity: The Baltimore-Washington, D.C. area and, to a lesser extent, the Philadelphia area are primarily surrounded by open landscapes. Pattern quality could be enhanced by designation of those lands most suitable for urban development ten to thirty years hence and encouraging forest development on those lands while ensuring the continuation of the most suitable agricultural lands as open lands. The forested or tree-covered areas are not only generally viewed as more desirable residential environments but they create a sharper edge and contrast between open land and covered land.

The forested landscape is also more absorbent of the visual ramifications of man's activities-particularly the building of structures. Suburban development is accomodated in a visually more satisfying manner. Woodlands provide a setting wherein structures appear to be more integrated with the landscape than do open fields. Thus, a planning program directed to delineating future metropolitan expansion areas, preparing them in advance by afforestation programs, and identifying prime lands for agriculture and protecting them from development will enhance landscape quality through the creation of more diverse patterns. Coupled with this activity should be the protection of all waterways and major drainageways as an integrated open space system serving both as the boundary between open lands and covered lands and the link between sections of covered or forested lands.

Define Landscape Pattern: In the forest image landscapes around Boston-Providence and the New York area, the problem is the opposite. Open land is a scarce element in the landscape. Opportunities to create large open areas out of presently forested areas are obviously limited.

The creation of openings in the forest cover by new impoundments offers some opportunities but the visual impact will probably be of local significance only. Impoundments could also however, increase recreational opportunities for adjacent urbanities. In great enough quantity, the impoundments could serve as the stimulus for a new landscape pattern built around recreation, resort and tourism activities. Protection of existing open land-small farm fields and wetlands-is obviously very important.

A lesser degree of contrast, but within the context of these landscapes an essential one, can be obtained by the delineation and protection from development of all major waterways and drainage ways. Contrast between built-upon forest land and unbuilt-upon forest land is not as great as contrast between built-upon forest land and unbuilt-upon open land. There is, nevertheless, a degree of contrast that does contribute to landscape quality, and again the regional open space system created in this fashion serves to link areas and to act as a determinant of urban growth patterns and the resultant forms of the metropolitan area and individual units within it.

THE DEVELOPMENT OF IMPROVED WATER QUALITY

As mentioned in Section II, every major city in the region is located on either a river or an estuary. The central cities identified in Class 1 subregions by the Regional Plan Association in the <u>Study of Present and Projected Urban Development and Land Use in North Atlantic Region,</u> 1969; New York, Newark, Philadelphia, Camden, Baltimore, Boston, Washington, D.C., Arlington and Alexandria, accounted for 61.9 percent of the region's population in 1960. These nine cities had populations of over 250,000 and gross densities greater than 10,000 persons per square mile. The twenty-four central cities in Class 2 subregions which had populations of 150,000 to 250,000 and densities of 5,000 to 10,000 persons per square mile accounted for another twenty percent of the population. The thirteen central cities in Class 3 subregions had populations ranging between 75,000 and 150,000 with gross densities between 5,000 and 10,000 persons per square mile in 1960. Central cities in Classes 4 and 5 had populations under 75,000 and gross densities below 5,000 persons per square mile. The central cities in Class 1, 2 and 3 subregions contain 61.9, 20.0 and 9.1 percent of the region's population respectively. Thus, 91 percent of the population lives in cities of over 75,000 and 81.9 percent live in cities of over 150,000 population with gross densities in excess of 5,000 persons per square mile.

Clean water in all or parts of the rivers adjacent to these cities coupled with waterfront access programs could satisfy enormous needs for the various recreational water contact activities. Clean water for this purpose is defined by the United States Public Health Service in Health Guidlines on Recreation Area Development and Vector Control (Preliminary Issue), 1967 as:

Biological-the fecal coliform density should not exceed a geometric mean of 200/100 ml. No sample's fecal coliform density should exceed 400/100 ml.

Chemical-the water should contain no chemical which could cause toxic reaction if ingested or irritation to the skin or eyes. The water's pH should be within the range 6.5 to 8.3

Physical-the water's color should not exceed 15 standard units and its turbidity should not exceed 30 standard units. Maximum water temperatures should not exceed 85 degrees F (30 degrees C).

Initial steps in providing clean water in urban areas for amenity and recreation values could consist of providing water of acceptable quality in part of a river, such as a basin separated from the main body by a physical barrier. Purification would then be required initially for only a relatively small percentage of the water in the system while providing the greatest user benefits for the largest number of people.

THE DEVELOPMENT OF URBAN AMENITIES

Both urban waterfronts and suburban linear parks along rivers can provide urbanities with much of the water and related land-based recreation needs. These developments, when well planned, also increase the visual quality of urban areas, introduce variety into the pattern of the city and serve as determinants of urban growth. Flood plains, stream valleys and steep slopes in fringe city areas can become the nucleus of greenway systems throughout the city units. Usable water, open space and masses of vegetation are the three major natural components that provide a structure for cultural amenities (within the concept of this study) and quality of life within the city. Usable water has been discussed in part in the previous section. Adequate supplies to satisfy the needs for street cleaning, irrigation, fountains and air conditioning are essential. Quantification of these needs is included in the Appendices dealing with municipal and industrial water supply and with irrigation. Land and

and water areas for recreation needs have also been quantified in the recreation appendix.

Center City Waterfront: The satisfaction of the need for open space and vegetation in the center and intermediate city is one that must be aggressively coupled with opportunity. Renewal and rehabilitation programs provide the opportunity to reclaim waterfronts which were formerly devoted to industrial and warehousing activities, activities which in many instances are no longer viable in those locations. Within the city, essentially the entire waterfront should be available to the public. The depth of public accessibility can vary from the width of a path to a major park hundreds of feet in depth along the waterfront.

Fringe City Open Space: Open space is the key ingredient in a series of case studies of cluster type residential development reported on by W.H. Whyte in Cluster Development, 1964. This is open space which satisfies residential environment recreation needs and also encompasses some conservation lands, steep slopes and stream valleys. The median percentage of open space in forty-six case studies reported on was 26 percent, the mean for the forty-six cases was 27.2 percent. Cluster developments and planned unit developments permit intensive development of housing units on small acreages while setting aside adjacent open spaces. For example, instead of subdividing a forty acre tract of land bisected by a stream into sixty one-half acre lots (assuming ten acres for roads and right of ways), the tract might be developed into sixty one-third acre lots with the remaining ten acres reserved for permanent open space along the stream. This approach to residential development accomodates both the reported continuing trend to suburban living patterns and the probable continuing desire for private ownership. It also provides desirable open space in close proximity to the dwelling units and provides for the protection of important or fragile resource values (steep slopes, wetlands, stream valleys,etc.).

The land resource did not appear to present major natural obstacles (wetlands, steep topography, drainageways, etc.) to development in most of the previously cited case studies which were reported on. Most of the open space satisfies recreation and amenity values primarily and conservation values secondarily. Thus, it is assumed for this study that 25 to 30 percent open space in residential areas represents a desirable mix for a quality environment. The Regional Plan Association report estimates that residential land will account for about

55 percent of all developed land in the region.

It can also be assumed that some percentage of the developed land used for purposes other than residential should not be built upon because of flood potential, aquifer recharge needs or the protection of other natural values. For this study, this is assumed to average from 5 to 10 percent of the land involved.

Combining these open space figures, 25 to 30 percent of the residential land or 11 to 18 percent of the total and 5 to 10 percent of the other developed land or 3 to 5 percent of the total developed land indicates an optimum average open space in the fringe city of approximately 14 to 23 percent of all developed land. Drainageways, steep slopes and flood plains are the key ingredients in the development of an integrated open space system for areas presently developing within the fringe city unit as well as for those to be developed in the future.

SUMMARY

Table N-10 presents a summary of the needs by individual basin or area. The data in the table were arrived at by the application of the criteria set forth in Section II to the inventory and evaluation data in Section III. The figures under shoreline preservation are in linear miles and under development of clean water represent the percent of the basin that is urbanized. All other figures represent square miles.

These data are the basis for the needs discussed in the basin summaries, Section VI. The needs in each basin are related to suggested devices and the bench mark years or priority of implementation as well as the environmental quality, regional development and national efficiency planning objectives.

FIGURE N-39

MAP- NEEDS, PLANNING & MANAGEMENT

(In pocket at back of book)

TABLE N-10

NEEDS BY BASIN

BASIN	Preserve unique natural landscape (sq. mi.)	Preserve shoreline (linear miles)	Protect landscape quality (sq. mi.)	Protect landscape diversity (sq. mi.)	Protect major ag. valleys (sq. mi.)	Develop landscape quality (sq. mi.)	Develop clean water (% of Basin)	Develop metro. amenities (sq. mi.)
1	6000							
2	1450		4800					
3			4800					
4			3300					
5	400	400	3300					
6			2100					
7			900			210	75%	35
8	3000		2100				40%	
9	200	20				600	100%	50
10		20		90		900	100%	55
11	2100		750	150	1600			
12				2400	2600		30%	50
13		80		100			100%	60
14				90		390	100%	60
15		16		3600	800		100%	180
16	300	30				300	100%	16
17				900	250	300	25%	75
18	350	350		900		600	50%	35
19	1000	90		2100	2000		70%	40
20	1000	64		900			75%	
21	80	80					10%	11
TOTAL	15880	1150	22050	11230	7250	3300		667

SECTION V: DEVICES

INTRODUCTION

The following discussion of water management devices includes both the consideration of those devices most suitable for satisfying visual and cultural needs and an evaluation of the visual, cultural and ecological impact of various other devices on different landscapes. Table N-11 shows the relationship of the visual and cultural needs to all devices and indicates which devices have a potential positive value in satisfying the different needs. Tables N-12 through N-16 indicate the probable visual, cultural and ecological impact of devices on the different Series and Units. These tables together with the supporting text are intended to provide a framework within which to estimate and evaluate the probable impact of future individual water resource development projects in the region.

RELATIONSHIP OF DEVICES TO VISUAL AND CULTURAL NEEDS

Of the twenty-seven possible devices considered in the NAR study, twelve are indicated in Table N-11 as being most suitable for satisfying visual and cultural needs. The preservation of unique areas or sites is most effectively accomplished by fee simple acquisition individually or in concert with conservation easements or purchase and lease back arrangements. These latter two techniques or devices may also be of value in protecting buffer zones around a natural area or historic site.

The protection or maintenance of existing high quality landscapes, of agricultural landscapes and of landscape diversity also relies heavily upon the use of legal devices. Some fee simple purchase may be useful in protecting those landscapes which also have potential for national, regional or state parks or recreation areas. In general however, these needs will be more normally approached through the use of conservation easements, purchase and lease back, zoning and other police power regulations. Tax incentives and/or subsidies are probably the most effective existing devices for the maintenance of agricultural landscapes in areas beyond the two and one-half hours time-distance zone.

The development of landscape quality, clean water and metropolitan amenities will obviously require the whole range of legal devices as well as other non-

TABLE N-11

DEVICES MOST LIKELY TO BE USED FOR VISUAL AND CULTURAL NEEDS

DEVICES	Preserve Unique Natural & Cultural Landscapes	Protect Quality Landscapes	Protect Composite Landscapes	Develop Quality Landscapes	Develop Clean Water	Develop Metro-politan Amenities
Legal: Fee Simple Purchase	x					x
Purchase-Lease Back	x		x			x
Easements	x	x	x	x		x
Deed Restriction	x	x	x			
Zoning	x	x	x		x	x
Tax Incentive and/or Subsidy	x		x	x	x	x
Demand Constraint		x	x			
Education						
Diversion						
Impoundment				x		x
Ground Water Management Facility						
Weather Modification						
Channel Improvement						
Clearing & Cleaning				x		
Local Flood Protection						
Bank Protection						
Coastal Protection						
Water Supply Installation				x		x
Water Renovation Installation						
Desalination Installation						
Off-Stream Cooling Installation						
Hydroelectric Power Installation						
Navigation Facility						
Recreation Facility				x		x
Fish & Wildlife Facility		x	x	x		x
Drainage Facility						
Waste Disposal Facility		x		x		
Flood Plain Management		x	x	x	x	
Watershed Management		x	x	x	x	
Preservation	x	x				
Research						
Waste Treatment		x		x	x	

physical and physical devices. The range of devices and their applications include: fee simple purchase of parklands and shorelines, flood plain zoning and/or conservation easements to maintain open space and to protect steep slopes and wetlands in the path of expanding urbanization, an increase in water supply for metropolitan areas to insure adequate supplies for water-oriented amenities, the institution of watershed management and waste treatment facilities for clean water, the development of recreation facilities, and the use of impoundments, fish and wildlife management, watershed management and flood plain zoning to improve landscape diversity and pattern.

Most of the devices mentioned above are discussed in the second part of this chapter. Because of the importance of legal devices in reference to visual and cultural needs however, they are discussed first.

LEGAL DEVICES

Legal devices, in reference to the visual and cultural needs, relate to the ownership of rights in land and to the control of uses of land. Ownership of rights or interests include: fee simple title, lease, conservation or scenic easement, easement or right-of-way and deed restrictions and covenants. Public interest in land can be acquired by either negotiating a purchase, purchase by the public right of eminent domain or by donation to a public or private charitable agency. The following discussion of legal devices is limited to a brief definition of each device and some of its potential uses.

Ownership of Rights in Land: Fee simple title is the ownership of all rights in the land. By this device a public agency has full control of the land. Thus it is best suited for purposes of preserving unique natural areas, wildlife habitat, historic sites, etc. and for developing areas for outdoor recreation. The cost of acquisition is a drawback however so that this device is limited in terms of dealing with the problems of large scale landscape quality protection.

A lease is a conveyance of a right to use land for various purposes for a certain period of time. It permits private management under public controls or ownership as, for example, forest management and harvesting by a private company on public forest land. Agricultural land may be acquired by fee simple purchase by public institutions and leased back to a

private operator for agricultural purposes. Leasing may also accomplish similar purposes as a conservation easement.

Conservation or scenic easements are rights granted to a public or charitable agency which limit such activities as development, alteration of land form or cutting of trees, while the land remains in private ownership. A conservation easement might be more accurately termed a conservation restriction as it gives no affirmative rights to use the land by the holder of the easement. Conservation easements are potentially useful for protecting buffer zones around unique natural or historic sites, for preventing development on agricultural lands and to provide scenic views along a highway or navigable river. The easement device should provide a less costly means both in acquisition costs and later management than fee simple acquisition.

Right-of-way easements provide public (or private) access across another owner's property. They are useful for providing access to streams and beaches and for hiking trails.

Restrictions may be inserted in the deed, in the transfer of land, which limit or prohibit development. Similarly, land owners may enter agreements or "covenants" amongst themselves limiting development or they may form an association to own land in common for conservation purposes. Deed restrictions and covenants are used where land is to be developed for residential purposes, for conserving stream valleys, steep slopes and lake shores. They are in effect private zoning devices, supplementing cluster or planned unit development zoning.

Land Use Controls: Zoning, building codes and pollution control regulations are common examples of land use control through the police power. There are two general requirements for the exercise of police power: 1. that the regulations be for the general welfare, safety and health of the public, and 2. that the regulations not amount to the taking of private property for a public use (e.g. as for a public park) nor deprive the private land owner of all uses of his property. Aesthetics has been determined to be within the concept of general welfare; hence the acceptance of historic district zoning. Zoning for reasons of health and safety have greater acceptance and may have the result of also preserving visual qualities of the landscape as for example in flood plain and wetland zoning.

Examples of types of zoning include: residential, planned unit development, cluster, historic district, flood plain, wetlands and agricultural zoning. Their purpose is to limit the use of the land to specific activities such as wildlife habitat, subdivision or farming and to set general controls such as lot size and density in residential, planned unit development or cluster zones.

Other types of police power regulations include: channel encroachment line regulation, inland wetland regulations, shoreline and coastal wetland regulations, compensatory regulations and water and air pollution control regulations. Channel, shoreline and wetland regulations are oriented to the control or prevention of development.

Compensatory regulations are similar to other land use controls but provide compensation for the land owners affected. Water and air pollution control regulations limit or prohibit water and air pollution with penalties for violation.

Because police power regulation depends on political process, it is subject to change. Thus zoning has not proved to be effective in many instances because economic or political pressures have forced undesirable changes in the zoning to accommodate incompatible uses or special interests. The chief advantage of zoning is that it requires no expenditure of public funds in the form of compensation for land.

Regulation of land use is generally a local or municipal responsibility. Hence local considerations can and frequently do take precedence over regional considerations. As a result, resources which do not respect political boundaries such as watersheds and flood plains do not receive consistent and logical treatment.

<u>Tax Incentives and Subsidies</u>: Tax incentives include income tax deductions and real estate tax abatement. Income tax deductions of various types for proper environmental management such as the installation of pollution control devices and real estate tax abatement for land in open space uses such as agriculture are possible uses of tax incentives.

Subsidies and government financial assistance take the form of subsidies for agriculture and grants for pollution control and for planning.

Preservation of Agricultural Land: In many parts of the NAR, agricultural lands make an extremely important contribution to landscape diversity and to aesthetic quality. The legal devices listed above have potential for encouraging continued agricultural use. Preservation of agricultural lands is so important as to warrant continuing study of the effective application of these devices and continuing search for new devices at all levels of government. Appendix G, pages G-162 through G-187 contains data which bears on this matter.

EVALUATION OF THE VISUAL, CULTURAL AND ECOLOGICAL IMPACT OF DEVICES

The devices discussed in this section have been divided into two groups: physical devices and physical-nonphysical devices.

Physical devices are those which consist of a structure placed upon the land or a treatment or an action applied to the land which results in a physical change. They have been grouped on the basis of common characteristics into four categories;

Category A - Treatment or actions for channel improvement such as: filling and excavating, clearing and cleaning, bank protection and diversion.

Category B - Linear structures for local protection against floods and for coastal protection such as: dikes, levees and flood walls,, sea walls, breakwaters, groins, jetties, sea levees, barriers and sand fill-beach stabilization.

Category C - Buildings and other large structures such as: power generating installations, waste treatment installations, water renovation installations, desalination installations, off-stream cooling installations, dams and hydroelectric power installations.

Category D - Facilities characterized by minor structures dispersed over large areas such as: recreation facilities, fish and wildlife facilities, ground water management facilities, drainage facilities, navigation facilities, waste disposal facilities and impoundments.

Physical-nonphysical devices deal with the planning and management of larger water systems and larger areas of the landscape. They may employ physical devices as a means of achieving the desired objectives. These devices include: flood plain management, watershed management and preservation.

Both groups of devices have been analyzed on the basis of their visual, cultural and ecological impact upon the landscape. The analysis is general. The scale of the NAR and the diversity of its landscape precludes specific analysis which would be based on site considerations. Obviously the potential variations in sites between Maine and Virginia, at which a single device might be used, are enormous. Therefore, the analysis remains general and is concerned with the basic characteristics and attributes of the device itself and with the most probable visual, cultural and ecological impact resulting from its use. The Landscape Series or topographic form and the Landscape Unit or pattern are both of prime importance in assessing the visual, cultural and ecological impact.

PHYSICAL-NONPHYSICAL DEVICES

These devices deal with the planning and management of larger water systems and landscape areas. They relate to the development of land and water management policy and to both short and long range planning. Included are flood plain management, watershed management and preservation.

These devices are most often regulatory and restrictive and relate to the control, correction or protection of various land uses. As such, they provide great potential for influencing the visual landscape image and opportunities for cultural uses over large land areas. While physical devices alone are most often significant at the site level, flood plain and watershed management encompass large areas and many individual sites.

The nonphysical aspects of these devices include a broad range of legal options which are discussed in the first portion of this section. The reader is referred to this for a review of the possibilities and limitations of various land use controls.

The use of these devices provides a greater potential to deal with water management problems in a creative way. A wider range of alternative approaches to management problems is provided including, most importantly, the use of natural process as a management device in lieu of physical or structural devices.

T A B L E N-- 12

POTENTIAL VISUAL IMPACT OF WATER MANAGEMENT DEVICES ON LANDSCAPE SERIES

PHYSICAL DEVICES	M	SH	RH	UL	FL	C	X
Filling and Excavation	NNA	NNA	Lp-Ln	Lp-Ln	Lp-Ln	NNA	Lp-Ln
Clearing & Cleaning	NNA	NNA	Lp-Ln	Lp-Ln	Lp-Ln	NNA	Lp-Ln
Bank Protection	NNA	NNA	Lp-Ln	Lp-Ln	Lp-Ln	NNA	Lp-Ln
Diversion	NNA	NNA	NNA	O-Hn	O-Hn	NNA	O-Hn
Dikes, Levees, Flood Walls	NNA	NNA	Ln-Hn	Ln-Hn	Ln-Hn	NNA	Ln-Hn
Sea Walls, Breakwaters, Sea Levees, etc.	NNA	NNA	NNA	NNA	NNA	Lp-Hn	NNA
Sand Fill-Beach Stabilization	NNA	NNA	NNA	NNA	NNA	Hp-Lp	NNA
Power Generating Installation	O-Ln	O-Ln	Ln	Ln-Hn	Ln-Hn	Ln-Hn	Ln-Hn
Waste Treatment & Water Renovation Inst.	NNA	NNA	Lp-Ln	Lp-Ln	Lp-Ln	NNA	NNA
Desalination Installation	NNA	NNA	NNA	NNA	NNA	O-Ln	NNA
Off Stream Cooling Installation	O-Hn	O-Hn	O-Hn	O-Hn	O-Hn	Ln-Hn	Ln-Hn
Dams & Hydroelectric Power Installations	Lp-Ln	Lp-Ln	O-Ln	O-Hn	Ln-Hn	Ln-Hn	Lp-Ln
Recreation Facility	Lp-O	Lp-O	Lp-O	Lp-O	Lp-O	Hp-Ln	Lp-O
Fish & Wildlife Fac.	Lp-O	Lp-O	Hp-O	Hp-O	Hp-O	Hp	Hp-O
Water Supply Facility	Lp-O	Lp-O	O-Ln	O-Ln	O-Ln	O-Ln	Lp-O
Ground Water Management Facility	NNA	NNA	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln
Drainage Facility	NNA	NNA	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	NNA
Navigation Facility	NNA	NNA	NNA	Lp-Ln	Lp-Ln	Lp-Ln	NNA
Waste Disposal Fac.	NNA	NNA	Ln-Hn	Ln-Hn	Ln-Hn	Ln-Hn	Ln-Hn
Impoundments	Hp-Lp	Hp-Lp	Hp-Lp	Hp-Lp	Hp-Lp	NNA	Hp-Lp
PHYSICAL/NON-PHYSICAL DEVICES							
Flood Plain Mgmt.	NNA	NNA	NNA	Hp-Hn	Hp-Hn	Hp-Hn	Hp-Hn
Watershed Mgmt.	Hp-O	Hp-O	Hp-O	Hp-O	NNA	NNA	Hp-O
Preservation	Hp-O	Hp-O	Hp-O	Hp-O	Hp-O	Hp-O	Hp-O

LEGEND

NNA	Not normally applicable	M	Mountains
Hp	Moderate to high positive visual impact	SH	Steep Hills
		RH	Rolling Hills
Lp	Low to moderate positive visual impact	UL	Undulating Land
O	No significant change in visual impact	FL	Flat Land
		C	Coastline
Ln	Low to moderate negative visual impact	X	Compound
Hn	Moderate to high negative visual impact		

TABLE N-13

POTENTIAL VISUAL IMPACT OF WATER MANAGEMENT DEVICES ON LANDSCAPE UNITS

PHYSICAL DEVICES	CC	IC	FC	TFa	Fa	FaFo	FoT	FoW
Filling and excavation	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln
Clearing & Cleaning	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln
Bank Protection	Lp-Hn	Lp-Hn	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln
Diversion	Lp-Hn	Lp-Hn	Lp-Hn	O-Hn	O-Hn	O-Hn	O-Hn	O-Hn
Dikes, Levees, Flood Walls	Ln-Hn	Ln-Hn	Ln-Hn	Ln-Hn	Ln-Hn	Ln-Hn	Ln-Hn	Ln-Hn
Sea Walls, Breakwaters, Sea Levees, etc.	NNA	Lp-Ln	Lp-Ln	NNA	NNA	NNA	NNA	NNA
Sand Fill-Beach Stabilization	NNA	Hp-Lp	Hp-Lp	NNA	NNA	NNA	NNA	NNA
Power Generating Installation	Ln-Hn	Ln-Hn	Ln-Hn	O-Hn	Ln-Hn	Ln-Hn	Ln-Hn	O-Hn
Waste Treatment & Water Renovation Ins.	NNA	Lp-Ln	Lp-Ln	Lp-Ln	NNA	NNA	NNA	NNA
Desalination Installation	NNA	Lp-Ln	O-Ln	NNA	NNA	NNA	NNA	NNA
Off Stream Cooling Installation	Ln-Hn	Ln-Hn	Ln-Hn	O-Hn	O-Hn	O-Hn	O-Hn	O-Hn
Dams & Hydroelectric Power Installation	NNA	NNA	O-Hn	Lp-Hn	O-Hn	Lp-Hn	Lp-Hn	Lp-Hn
Recreation Facility	Hp-Lp	Hp-Lp	Lp-O	Lp-O	Lp-O	Lp-O	Lp-O	Lp-O
Fish & Wildlife Fac.	NNA	NNA	NNA	Hp-O	Hp-O	Hp-O	Hp-O	Hp-O
Water Supply Fac.	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	O-Ln	O-Ln	O-Ln	Lp-Ln
Ground Water Management Facility	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln
Drainage Facility	NNA	NNA	NNA	Lp-Ln	Lp-Ln	Lp-Ln	NNA	NNA
Navigation Facility	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	Lp-Ln	NNA
Waste Disposal Fac.	Ln-Hn	Ln-Hn	Ln-Hn	Ln-Hn	NNA	NNA	Ln-Hn	NNA
Impoundments	NNA	NNA	Hp-Lp	Hp-Lp	Hp-Lp	Hp-Lp	Hp-Lp	Hp-Lp
PHYSICAL NON-PHYSICAL DEVICES								
Flood Plain Mgmt.	Hp-Hn	Hp-Hn	Hp-Hn	Hp-Ln	Hp-Hn	Hp-Hn	Hp-Hn	Hp-Hn
Watershed Mgmt.	NNA	NNA	NNA	Hp-O	Hp-O	Hp-O	Hp-O	Hp-O
Preservation	Hp-O	Hp-O	Hp-O	Hp-O	Hp-O	Hp-O	Hp-O	Hp-O

LEGEND

NNA	Not normally applicable
Hp	Moderate to high positive visual impact
Lp	Low to moderate positive visual impact
O	No significant change in visual impact
Ln	Low to moderate negative visual impact
Hn	Moderate to high negative visual impact

CC	Center City
IC	Intermediate City
FC	Fringe City
TFa	Town-Farm
Fa	Farm
FaFo	Farm-Forest
FoT	Forest-Town
FoW	Forest-Wildland

T A B L E N - 14

POTENTIAL CULTURAL IMPACT OF WATER MANAGEMENT DEVICES ON LANDSCAPE SERIES

PHYSICAL DEVICES	M	SH	RH	UL	FL	C	X
Filling and excavation	NNA	NNA	Li-O	Li-O	Li-O	NNA	Li-O
Clearing & Cleaning	NNA	NNA	Li-O	Li-O	Li-O	NNA	Li-O
Bank Protection	NNA	NNA	Li-O	Li-O	Li-O	NNA	Li-O
Diversion	NNA	NNA	NNA	Li-O	Li-O	NNA	NNA
Dikes, Levees, Flood Walls	NNA	NNA	O-Ld	O-Ld	O-Ld	NNA	O-Ld
Sea Walls, Breakwaters, Sea Levees, etc.	NNA	NNA	NNA	NNA	NNA	Li-Hd	NNA
Sand Fill-Beach Stabilization	NNA	NNA	NNA	NNA	NNA	Hi-Li	NNA
Power Generating Installation	O	O	O	O-Ld	O-Ld	Ld	O-Ld
Waste Treatment and Water Renovation Inst.	NNA	NNA	Li-O	Li-O	Li-O	NNA	Li-O
Desalination Inst.	NNA	NNA	NNA	NNA	NNA	O-Hd	NNA
Off Stream Cooling Installation	O	O	O	O-Ld	O-Ld	Ld	O-Ld
Dams & Hydroelectric Power Installations	Li-O	Li-O	Li-O	Li-Ld	Li-Ld	Li-Hd	Li-O
Recreation Facility	Li	Hi	Hi	Hi	Li	Hi	Hi
Fish & Wildlife Fac.	Li	Li	Li	Li	Li	Li	Li
Water Supply Facility	O	O	Li	Li	Li	Li	Li
Ground Water Management Facility	NNA	NNA	Li-Ld	Li-Ld	Li-Ld	Li-Ld	Li-Ld
Drainage Facility	NNA	NNA	Li-O	Li-Ld	Li-Ld	Li-O	NNA
Navigation Facility	NNA	NNA	NNA	Li-Ld	Li-Ld	Li-Ld	NNA
Waste Disposal Fac.	NNA	NNA	Ld-Hd	Ld-Hd	Ld-Hd	Ld-Hd	Ld-Hd
Impoundments	Hi-Li	Hi-Li	Hi-Li	Hi-Li	Li	NNA	Hi-Li
PHYSICAL/NON-PHYSICAL DEVICES							
Flood Plain Mgmt.	NNA	NNA	NNA	Hi-Hd	Hi-Hd	Hi-Hd	Hi-Hd
Watershed Mgmt.	Hi-Li	Hi-Li	Hi-Li	Hi-Li	NNA	NNA	Hi-Li
Preservation	Hi-Ld	Hi-Ld	Hi-Ld	Hi-Ld	Hi-Ld	Hi-Ld	Hi-Ld

LEGEND

NNA	Not normally applicable	M	Mountains
Hi	Opportunity for moderate to high increase in use	SH	Steep Hills
		RH	Rolling Hills
Li	Opportunity for low to moderate increase in use	UL	Undulating Land
O	No significant change in use	FL	Flat Land
		C	Coastline
Ld	Low to moderate decrease in use opportunities	X	Compound
Hd	Moderate to high decrease in use opportunities		

T A B L E N - 15

POTENTIAL CULTURAL IMPACT OF WATER MANAGEMENT DEVICES ON LANDSCAPE UNITS

PHYSICAL DEVICES	CC	IC	FC	TFa	Fa	FaFo	FoT	FoW
Filling and Excavation	Hi-O	Hi-O	Hi-O	Li-O	Li-O	Li-O	Li-O	Li-O
Clearing & Cleaning	Hi-O	Hi-O	Hi-O	Li-O	Li-O	Li-O	Li-O	Li-O
Bank Protection	Hi-O	Hi-O	Hi-O	Li-O	Li-O	Li-O	Li-O	Li-O
Diversion	Hi-O	Hi-O	Hi-O	Li-O	Li-O	Li-O	Li-O	NNA
Dikes, Levees, Flood Walls	Hi-Hd	Hi-Hd	Li-Hd	O-Ld	O-Ld	O-Ld	O-Ld	O-Ld
Sea Walls, Breakwaters, Sea Levees, etc.	NNA	Li-Hd	Li-Hd	NNA	NNA	NNA	NNA	NNA
Sand Fill-Beach Stabilization	NNA	Hi-Li	Hi-Li	NNA	NNA	NNA	NNA	NNA
Power Generating Installation	O-Hd	O-Hd	O-Hd	O-Ld	O-Ld	O-Ld	O-Ld	O-Ld
Waste Treatment and Water Renovation Ins.	NNA	Hi-O	Hi-O	Li-O	NNA	NNA	NNA	NNA
Desalination Instal.	NNA	Hi-Li	Hi-Li	NNA	NNA	NNA	NNA	NNA
Off Stream Cooling Installation	O-Hd	O-Hd	O-Hd	O-Ld	O-Ld	O-Ld	O-Ld	O-Ld
Dams & Hydroelectric Power Installations	NNA	NNA	Hi-Ld	Li-Ld	Li-Ld	Li-Ld	Li-Ld	Li-O
Recreation Facility	Hi	Hi	Hi	Hi-Li	Hi-Li	Hi-Li	Hi-Li	Hi-Li
Fish & Wildlife Fac.	NNA	NNA	NNA	Li	Li	Li	Li	Li
Water Supply Fac.	Hi	Hi	Hi	Li-O	Li	Li-O	Li-O	Li-O
Ground Water Management Facility	Li-Ld	Li-Ld	Li-Ld	Li-Ld	Li-Ld	Li-Ld	Li-Ld	Li-Ld
Drainage Facility	NNA	NNA	NNA	Li-Ld	Li-Ld	Li-Ld	NNA	NNA
Navigation Facility	Li-Ld	Li-Ld	Li-Ld	Li-Ld	Li-Ld	Li-Ld	Li-Ld	NNA
Waste Disposal Facil.	Ld-Hd	Ld-Hd	Ld-Hd	Ld-Hd	NNA	NNA	Ld-Hd	NNA
Impoundments	NNA	NNA	Hi-Li	Hi-Li	Hi-Li	Hi-Li	Hi-Li	Hi-Li
PHYSICAL/NON-PHYSICAL DEVICES								
Flood Plain Mgmt.	Hi-Hd	Hi-Hd	Hi-Hd	Hi-Hd	Hi-Hd	Hi-Hd	Hi-Hd	Hi-Hd
Watershed Mgmt.	NNA	NNA	NNA	Hi-Li	Hi-Li	Hi-Li	Hi-Li	Hi-Li
Preservation	Hi-Ld	Hi-Ld	Hi-Ld	Hi-Ld	Hi-Ld	Hi-Ld	Hi-Ld	Hi-Ld

LEGEND

NNA	Not normally applicable	CC	Center City
Hi	Opportunity for moderate to high increase in use	IC	Intermediate City
		FC	Fringe City
Li	Opportunity for low to moderate increase in use	TFa	Town-Farm
O	No significant change in use	Fa	Farm
		FaFo	Farm-Forest
Ld	Low to moderate decrease in use opportunities	FoT	Forest-Town
Hd	Moderate to high decrease in use opportunities	FoW	Forest-Wildland

TABLE N-16

POTENTIAL ECOLOGICAL IMPACT OF WATER MANAGEMENT DEVICES ON LANDSCAPE SERIES

PHYSICAL DEVICES	M	SH	RH	UL	FL	C	X
Filling and Excavation	NNA	NNA	2-3	2-3	2-3	NNA	2-3
Clearing & Cleaning	NNA	NNA	1-2	1-2	1-2	NNA	1-2
Bank Protection	NNA	NNA	2-3	2-3	2-3	NNA	2-3
Diversion	NNA	NNA	NNA	2-3	2-3	NNA	2-3
Dikes, Levees, Flood Walls	NNA	NNA	1-2	1-2	1-2	NNA	1-2
Sea Walls, Breakwaters, Sea Levees, etc.	NNA	NNA	NNA	NNA	NNA	1-3	NNA
Sand Fill-Beach Stabilization	NNA	NNA	NNA	NNA	NNA	0-1	NNA
Power Generating Installation	1-3	1-3	1-3	1-3	1-3	1-3	1-3
Waste Treatment and Water Renovation Inst.	NNA	2-3	2-3	2-3	2-3	2-3	2-3
Desalination Installation	NNA	NNA	NNA	0-3	0-3	0-3	NNA
Off Stream Cooling Installation	NNA	NNA	NNA	NNA	NNA	0-1	NNA
Dams & Hydroelectric Power Instllations	2-3	2-3	2-3	2-3	2-3	NNA	2-3
Recreation Facility	0-2	0-2	0-2	0-2	0-2	0-2	0-2
Fish & Wildlife Fac.	0-2	0-2	0-2	0-3	0-3	0-3	0-2
Water Supply Facility	3	3	3	3	3	3	3
Ground Water Management Facility	NNA	NNA	0-3	0-3	0-3	0-3	0-3
Drainage Facility	NNA	NNA	3	3	3	3	3
Navigation Facility	NNA	NNA	NNA	1-2	1-2	1-2	NNA
Waste Disposal Fac.	NNA	NNA	2-3	2-3	2-3	2-3	2-3
Impoundments	3	3	3	3	3	NNA	3
PHYSICAL/NON-PHYSICAL DEVICES							
Flood Plain Mgmt.	NNA	NNA	0-3	0-3	0-3	0-3	0-3
Watershed Mgmt.	0-3	0-3	0-3	0-3	NNA	NNA	0-3
Preservation	0	0	0	0	0	0	0

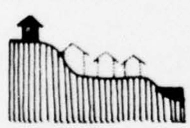
LEGEND

NNA	Not normally applicable	M	Mountains
0	No significant change	SH	Steep Hills
1	Potential for minor change	RH	Rolling Hills
2	Potential for moderate change	UL	Undulating Land
3	Potential for major change	FL	Flat Land
		C	Coastline
		X	Compound

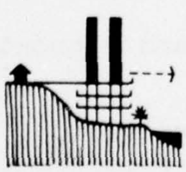
Flood Plain Management: Flood plain management is most effective when part of total river basin planning. Any local management decision may have effects on the total river system. For example, construction of channel improvements in an upstream community may increase flood potential downstream and require the application of other management measures in the upstream watershed.

A management program can be useful only when adequate funds are authorized and appropriated (as in the case of flood control dams or water supply improvement), or when preventive legislation is enforced. Federal management proposals often stimulate state legislation, local governmental action and, in some instances, generate action by individual property owners. For example, in the case of Public Law 566 Watershed Management Legislation in which the federal government provides professional assistance and partial funding, the state and local governments might provide land maintenance, project administration and additional funding while the property owners might adopt conservation practices.

There are two major approaches to flood plain management: correction and prevention. The intent of corrective management is to remove those structures, or conditions in the flood area which impede water flow and cause or are highly susceptible to flood damage. The flood plain can then either be redeveloped with structures which provide safety for the inhabitants and which accommodate flood waters, or it can be returned to less intensive use such as agriculture, recreation or wildlife management.



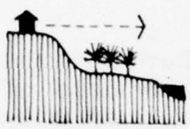
This approach substantially reduces or eliminates the likelihood that high economic losses will be incurred. By reclaiming the flood plain, corrective management also decreases the need for some upstream and downstream flood control measures. Re-use and redevelopment are not dependent upon control of flood water. If the flood plain is redeveloped for urban uses, the structures are designed to place all major activity areas above expected flood level.



The space below this level can be used for parking, vehicular and pedestrian circulation systems, recreation, etc. If the flood plain is returned to less intensive use such as recreation, agriculture or wildlife management, it is returned to uses which do not demand the control of flood water.

Preventive management is carried out on undeveloped

flood plains. It maintains their water carrying and flood storage capacity by either maintaining open space in the form of open fields or by allowing development with open floodable structures, structures that withstand flooding without change.

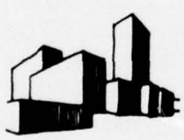


The basic difference between preventive and corrective management is the condition of the flood plain at the time management is implemented. Preventive management is addressed to the planning of essentially undeveloped flood plains while corrective management is concerned largely with rectifying mistakes of the past. Visual, cultural and ecological impacts are essentially the same for both.

Visual Impact

This is a most effective device for ameliorating the visual effects of land pattern misfits.

This device allows excellent opportunities for visual access to the water. Physical barriers such as levees are not placed between people and the water.



When the land is returned to less intensive use, the open space created adds variety to the landscape pattern and contrast to adjacent intensively used land. It helps to define the form of the adjacent urban areas and creates a strong edge.

When the land is re-used with appropriately designed structures, the pedestrian level and viewpoint are elevated above the flood plain and the water, providing new views and strong visual contrast at the junction of water and structure.

Cultural Impact

This device reduces fears and the social and economic losses caused by flooding.

When the land is returned to less intensive uses, greater opportunities may be provided for those forms of recreation which require large open land areas and easy direct access to the water.

Ecological Impact

It may allow re-establishment of original plant communities in less intensively developed areas on the flood plain if other factors such as flood probability, water quality and flood plain soils have not been altered from their original condition.

It could possibly hasten soil formation on the undeveloped part of the flood plain through periodic deposition of alluvium. This possible effect would also increase soil fertility for plants and consequently enlarge animal populations.

Watershed Management: Watershed management is used to prevent or decrease flooding and to achieve a more optimum utilization of the watershed. It achieves its goals through the implementation of sound land management practices and the development of flood water storage facilities. Generally more than one device, such as impoundments, recreation facilities, water supply facilities and fish and wildlife facilities are employed. Most of these are guided by Public Law 566. Watershed management is undertaken by governmental agencies operating alone or in collaboration with individual property owners.

Management areas are found in Farm, Farm-Forest, Forest-Town and Forest-Wildland Landscape Units and in particular those parts which are along the headwaters of the main water course.

Each of the managed watersheds has an effect, singly and collectively, on the whole river basin system. The watersheds at the headwaters have a proportionally greater impact on the flood plain system. The management of any one watershed, singly, within a river basin has little effect on the whole system but when all or the majority of the watersheds in the basin are managed, the combined effects can be quite significant.

The visual and cultural impact of watershed management can vary from being minimal to being quite significant. The magnitude depends upon several variables including the management measures undertaken, the character of the land form and its proximity to urban areas.

A watershed management-land management program is one in which the federal government assists land owners to achieve a better use of the land. A land management program will utilize one or more of the following practices: crop rotation, terracing, contour strip cropping, selective planting of cover crops and reforestation. As a result, the quality of agriculture and related land uses increases, and the flooding decreases. The quality of the water and the soil may also be improved.

Visual Impact

There is no significant impact from crop rotation unless it is used in large contiguous areas.

Contour strip cropping enriches the landscape pattern and, by working with the contours of the land, produces patterns which have a better "fit" with the land.

Through improved land management, farms are able to remain in operation and the valuable visual diversity and pattern provided by farmland is not lost from the landscape.

Selective planting and reforestation enriches pattern in areas that were predominantly open field agriculture. The reforestation of large areas, however, could contribute to monotony.

Cultural Impact

Land management helps to maintain and improve existing agriculture.

Ecological Impact

Local vegetative types can be preserved.

Silt load in streams and tributaries can be reduced.

Water, soil and plant relationships can be maintained and ground water supplies may be improved locally.

Watershed Management - Flood Water Storage: This is a program under which local authorities, aided by the federal government, plan and construct small to medium sized, multi-purpose impoundments in the watershed. These impoundments are used for water supply and flood control and in recreation and fish and wildlife

management areas. Regardless of their primary purpose, however, the impoundments always serve, to some degree, as flood control measures.

The impoundments seldom exceed 2500 acre-feet of capacity; the dams are usually small and of earth construction. The water level of the impoundment may undergo from slight to substantial changes depending upon climatic conditions and on how it is used. The dams and impoundments are most common within the Rolling Hill and Steep Hill landscapes. They may be found in abundance in certain watersheds.

Visual Impact

The addition of water always increases the variety of the landscape pattern. The number of water bodies added determines whether the increase in landscape quality extends beyond the immediate environs of an individual impoundment. A series of impoundments which enables an individual to periodically view water as he moves through the landscape can create a landscape image which is partly water-oriented. A single small impoundment is then, only an attractive and pleasant incident along the way.

Heavily forested landscapes derive the greatest benefit from the addition of water because it provides both variety and open space.

In a watershed with only a minimal portion of its surface in water, the increase of water surface uniformly distributed over three to five percent of the watershed would probably increase the pattern quality by one rank (from a low ranking landscape unit to medial or from a medial unit to high). The increase of the water surface uniformly distributed over ten percent of the watershed could result in a high pattern quality landscape.

The increase of water surface in any watershed generates new land uses such as recreation. Whether this results in a negative or positive visual impact depends a great deal on the quality of the design.

Also, see Visual Impact under Impoundments, Dams and Recreational Facilities when these are used in a flood water storage project.

Cultural Impact

This device almost always results in increased recreational and residential use (permanent and seasonal). The degree of impact depends a great deal on the character of the impoundments.

Ecological Impact

See discussion under Impoundments.

Preservation: Preservation is the careful limitation of the type and extent of development which may occur in areas judged to be of particular significance, usually at the national, state or regional level. These include areas of significant cultural, scenic, archaeological, geological, historic, and scientific value, wilderness and water resource and/or recharge areas. These sites are most often autonomous and are homogenous in character and pattern.

Preservation measures must consider the amount of development needed to both exploit and preserve intrinsic values. Some sites, such as archaeological sites, require considerable development to maximize their potential. In others, development should be minimized or avoided to maintain intrinsic values, as in certain scientific sites. Many of the historic and cultural sites appear along the shores of water bodies for man has long found water to his advantage for communication and for certain types of developments. Therefore, water control devices are a very important concern in preservation undertakings.

Preservation can be employed in all Landscape Series or Units. The material in the sections on Recreation Facilities and Fish and Wildlife Facilities will provide helpful information when these facilities are used as part of a preservation measure.

Visual Impact

Most of the preserved areas have an important and often dramatic visual interest. Preservation may even enhance the visual quality of the site.

The construction and other development necessary

to maintain a preserved area will affect the visual character of the site. Necessary development may include facilities for the control, transport and convenience of people and the display and protection of the preserved area.

If properly exercised, the visual impact of preservation measures and of the development itself on the surrounding area will be minor.

Physical (structural) devices may provide disturbing visual contrast with the preserved site.

Cultural Impact

A site may have many potential uses but preservation limits these to the one or two that pertain to the unique character of the site.

Some preserved sites attract large numbers of people. Preservation can be maintained only if measures are taken which enable the site to accommodate intensive use.

Intensity of use may be determined by the remoteness or accessibility of the site.

The use of a preserved site will vary in intensity over the day, the week, and the year, and even over longer periods depending upon the current interest in the phenomenon preserved.

A preserved site requires compatible uses in the surrounding area. A preserved natural area, for example, requires surrounding uses that do not add noise, chemical or thermal pollution to the site. An historic town needs quiet uses and natural vegetation in its surroundings to maintain its character.

A preserved site may affect the character of its surrounding area and can create new commercial land uses in the area to accommodate tourists.

Ecological Impact

Preservation maintains areas in their natural state. Existing plant and animal communities are not changed and the maturation process is neither accelerated or decelerated.

PHYSICAL DEVICES

Physical devices consist of a structure placed on the land or an action or treatment applied to the land which results in physical change. These changes can be simultaneously both assets and liabilities but more often they detract from rather than add to visual landscape quality. They have the greatest impact on the immediate surroundings but may also have indirect effects on a much larger area depending upon the relationship of the location of the device to surrounding topography and population density. Open flatland and more rugged topographic areas with long vistas would both increase the area of potential visual impact. Similarly population density of the area will, in part, determine the magnitude of the cultural impact.

When physical devices are seen in juxtaposition to seemingly natural landscapes they are by virtue of their man-made qualities, elements of strong contrast. Beautification after installation is not an answer to making any device more acceptable in the landscape. Of primary concern is the location of the device, and its suitability or unsuitability. Of equal importance when suitability has been determined is the design of the device itself.

CATEGORY A: TREATMENT OR ACTION DEVICES

Treatment and action devices, which in practice are often used in combination with one another, are discussed as: filling and excavation, clearing and cleaning, bank protection and diversion. These devices are applied to water courses for channel improvement and to achieve one or more of the following: the attainment of a faster, more efficient flow of water, the stabilization of the physical condition of the water course, improvement of the visual impact of the water course on its surroundings, the elimination of ponding or still water, the possibility of water damage, or the improvement of navigation potential. Application of the devices ranges from a one-step permanent solution to continued work on larger water courses.

These devices seldom include structures and normally have less visual and cultural impact upon their surroundings than do the other categories of physical devices. Certain ecological effects are common to all forms of treatment and action devices. The increased movement

of water caused by such a device may change stream ecology from older to more youthful conditions. In the locale of the device the aquatic biological productivity would shift from semi-aquatic forms to truly aquatic forms; there would be fewer rooted emergent plants and more fish life. The device may cause a reduction of siltation of the stream channel in the device area while causing a downstream shift of silt deposition. Estuaries downstream from the device would receive increased silt loads which could endanger shellfish, larvae and eggs of ocean fish and, depending upon the coastline configuration, salt marsh communities.

Disruption of the stream channel through deepening or straightening may destroy bottom flora and fauna. This is especially signficant in the case of cold water streams that rely on bottom organisms for primary production and the first phases of the aquatic food chain. In some instances, removal of submerged debris may reduce fish production by denying young fish a refuge from natural predation.

Filling and Excavation: This major form of channel improvement is accomplished by removing or adding fill materials to the bed or embankments of a water course. The changes may be temporary, and the results of the treatment are normally healed by nature over a period of several years in humid temperate climates such as are found in the NAR.

The changes frequently involve long linear sections of the water course (several miles) and require the access of large equipment along its entire length.

The embankment is exposed visually in differing amounts during the year.

The amount of excavation and filling, the regenerative capacity of the landscape, the potential for access and the kind and disposition of the excavated materials are all important considerations in determining the visual, cultural and ecological impact.

The device is most often used in Undulating Land and Flat Land Series.

Visual Impact

These devices have little or no impact on major land form configuration.

Contrast between the device and its surroundings is minimal because of the use of natural materials.

These devices tend to develop uniformity of depth, width, alignment and of flow characteristics thus reducing the existing variety, contrast and interest within the entirely of the waterway.

Excavated material can become a dominant visual problem when large quantities are tipped near the water course and can block views and create an unwelcome contrast to natural forms.

The initial visual contrast is decreased over time through new plant growth and the action of the water against the fill materials.

Cultural Impact

Opportunity for use of the water for activities such as swimming, fishing, commercial navigation or boating is increased.

Additional or improved water uses may alter adjacent land-use patterns by their requirements for land-based facilities and roads.

Adjacent vehicular and pedestrian circulation patterns are often altered by the removal of bridges and other structures.

Ecological Impact

Factors for eutrophication may be reduced.

Biological productivity in the form of plant growth may be reduced.

There may be an eventual stabilization of middle age productivity favoring insects and fish life if the results of the device are long lasting.

Clearing and Cleaning: Clearing and cleaning is a form of channel improvement which involves the removal of unwanted materials from the water course and its surroundings. Long stretches (several miles) of the water course are often involved. The results of clearing and cleaning are often temporary and the process must be repeated periodically. Like filling and excavation, the type and amount of material removed, the potential for access, and the size of the

channel are important elements in determining visual, cultural and ecological impact. Clearing and cleaning is most frequently used in Rolling Hill, Undulating Land and Flat Land Series.

Visual Impact

New and improved views to and from the water course are created.

Visual quality can be diminished by the intrusion of contrasting and incongrous changes in the form and alignment of the water course if the operation is not carefully designed and implemented.

Cultural Impact

The potential opportunities for navigation and some forms of recreation are increased.

Ecological Impact

Clearing and cleaning allows faster flow of water in the area treated and some degree of bottom scouring is likely. This may result in a less favorable substrate for rooted aquatic plants.

There may be a rise in dissolved oxygen due to the more rapid flow or there may be a reduction of dissolved oxygen due to the removal of materials in the channel that cause surface agitation.

Other aspects of the ecological impact are similar to that which occurs with filling and excavating.

Bank Protection: Bank protection is a device in which new surfaces or minor structures are added to the embankments or bed of a water course. It involves the placement of man-made materials on a natural surface. Brush, stone, wood, sheet pile, concrete wall and asphalt are some of the materials utilized. Flumes, chutes, weirs and check dams are minor structures which are used in conjunction with bank protection. The length, height and exposed nature of the bank and the material used are all important elements in determining visual, cultural and ecological impact. The device involves a visible part of the water course, the shoreline, and is most often used in Rolling Hill, Undulating Land and Flat Land Series.

Visual Impact

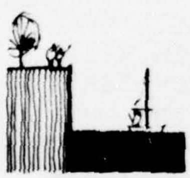
It creates a relatively permanent visual change in the shoreline.

The device is usually seen in strong contrast when used in natural areas because of the architectonic form and frequent use of man-made materials.

The complete visual image of a water course is often changed in a detrimental manner by eliminating the excitement and surprise of moving water over and along irregular and changing natural forms. The resultant visual impression is uniform, dull and predictable.

Visual appeal depends upon the choice of material, the susceptability of the material to damage and the stability of the bank material which is being protected.

Cultural Impact



The potential for water and related landuses such as parks, picnic grounds and fishing is often increased. When bank protection involves the use of vertical walls however, access to the water surface for recreational uses is made more difficult.

Ecological Impact

Some materials may reduce the quality of the conditions needed for aquatic plants and animals along the channel sides and bottom.

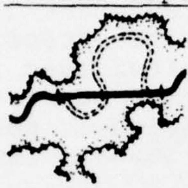
This device may also alter the amount of protective cover available for fish. For example, when materials with an irregular surface and form are used, cover may be increased. With materials such as asphalt, cover may be decreased.

Other aspects of the ecological impact are similar to that which occurs with filling and excavating.

Diversion: This major form of channel improvement changes the flow path of a water course by the creation of a new course or canal. Its use ranges from minor

alignment changes of a water course to diversion channels hundreds of miles long. The magnitude of the changes is an important element in determining the visual, cultural and ecological impact. It generally creates permanent visual and cultural changes and establishes new locational relationships between land areas and water courses. It involves a combination of geometric man-made channel forms and the natural landscape forms of land and water courses. Diversion is often used in combination with canals, rivers and reservoirs. It allows for other uses such as navigation, fish and wildlife habitat management and recreation. It is most often used in Flat Land and Undulating Land Series.

Visual Impact



The introduced geometric form creates a strong contrast in the landscape at the site of the diversion channel.

The relation between the geometric form of the diversion channel alignment and the natural forms and materials of the landscape determines to a large extent visual "fit" and acceptability.

The geometric form of the diversion channel in an urbanized area often offers less visual contrast.

Cultural Impact

Existing natural land use boundaries such as rivers and streams are moved, creating new edges to farm fields and other land uses. New barriers to circulation are also created.

Ecological Impact

See the ecological impact under Filling and Excavating.

CATEGORY B: LINEAR STRUCTURES

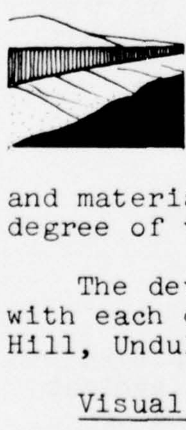
Linear structures are physical devices employed for two major purposes: for local protection against floods and for coastal protection. Nonphysical or management devices relating to flood protection are discussed under Flood Plain Management.

Flood walls, dikes and levees are the types of linear structures which are used for local area protection against flooding. Flood protection implies that

either man-made or natural landscape features would be damaged by flood water and these devices are therefore usually applied to areas of high social and economic investment. These devices can be thought of as permanent structures which offer protection to a limited and definable problem area to control a temporary phenomenon (flooding). Their success depends in part upon the accuracy of the flood predictions. It also depends upon other water control devices both up and down stream and on the extent and type of land use change which the installation of flood protection devices stimulates in the watershed.

Coastal devices are employed to counter the erosive action of the sea and to protect adjacent land. They are often employed over longer and more extensive linear areas (several miles) than are devices used for inland flood protection. The structures are constructed both on dry land and in the sea. They include: sea walls, breakwaters, groins, jetties, sea levees, barriers and sand fill for beach stabilization.

Dikes, Levees and Flood Walls: These devices are of concrete, metal or earth and are generally under twenty feet in height and exposed on one or both sides. They are built upon dry ground, generally parallel to a water body, to confine and control flood water. They separate the river from the developed areas and provide real and psychological security for the inhabitants of the flood plains.

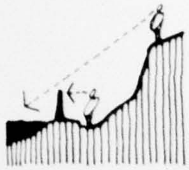


The devices are normally long and continuous. They have uniform height and alignment and are often taller than the average person. They make minimal space demands upon the landscape but have great visual, cultural and ecological impact. The height, length and material are important elements in determining the degree of visual, cultural or ecological impact.

The devices can be used alone or in combination with each other. They are most often used in Rolling Hill, Undulating Land and Flat Land Series.

Visual Impact

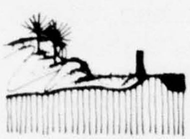
In areas with higher topographic variation and diversity in pattern the variation and diversity tend to interrupt the linear quality making the particular device less monotonous and dominant.



Topographic variation increases the possibility of regaining visual contact with water from points of varying elevation which are above the top elevation of the device.

At lower elevations the view of the water is cut off along most of its length.

Their form and location is frequently unrelated to adjacent natural or man-made features.

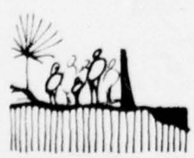


Dikes and levees, made of natural materials, contrast less with their natural surroundings than do flood walls which are of man-made materials (except in City Units where man-made materials predominate).

From the design standpoint, dikes and levees are more flexible than flood walls and thus are more likely to have a satisfactory design relationship with their surroundings. For example, the concept of levees can be expanded to a series of man-made hills, the tops of which would be free from flooding and could be used for building sites and the valleys or flood-prone lands could be used for parking, roads and open space. Visual and physical access to the water would thus be maintained and potentially enhanced.

Cultural Impact

By providing security they increase the potential for intensity of land use development and investment.



By cutting off access to the water, opportunities for recreational use are limited. Dikes and levees provide greater opportunity for additional uses such as recreation than do flood walls because they make access to the water easier.

Flood hazards for areas located both above and below the project may develop, giving rise to the need for additional management and protective measures.

Ecological Impact

These devices make a very small impact on the ecology of the stream but they do have an impact on the terrestrial ecology of the flood plain, not only on the site but above and below the site as well.

The deposition of silt on the flood plains is reduced, consequently reducing a natural source of fertility for flood plain soils.

By straightening and deepening the flood channel, water flows more rapidly and carries its silt load farther downstream to be deposited on the flood plain or on the deltas at the mouth of the stream. Increased deposition downstream will alter the make-up of the aquatic plant community by changing the channel substrata or cover over shellfish beds or fish spawning areas.

These devices may increase silt deposition upstream from the device in both the normal flow channel and the flood plain. This reduces spawning areas and promotes rooted aquatic vegetation in the slower moving water upstream.

Sea Walls, Breakwaters, Groins, Jetties, Sea Levees and Barriers: These are solid concrete, metal, wood or stone structures several feet in height and exposed partially or entirely on one or both sides. They are of uniform height and alignment and can be long and continuous. They are constructed upon dry ground or into the sea to limit and guide the extent of water movement. Their location, height and length are important in the determination of visual, cultural and ecological impact. They are frequently used in combination to achieve their intended purpose. They are most often used in the Mid-Atlantic Coastline and the Southern New England Coastline Sub-Series.

Visual Impact

The size of the devices and their repetition make them visible for great distances from both sea and land.

There is a lessened awareness of the land to water relationship for they are normally in strong contrast to the natural landscape in both form and material. A strong architectural edge is created which diminishes the

significance of the natural edge between land and water or between beach and upland.

Moving water in contact with these devices provides an element of visual attraction.

When not surrounded by moving water such as at low tide the structures can become static and visually dull - "misfits".

Cultural Impact

Sea walls, breakwaters, sea levees and barriers can provide safe refuge for small craft and provide accesss to the sea for fishing.

These devices can become physical barriers between land and sea. Thus they diminish opportunities for the most effective use by large numbers of people. By providing security they increase the potential for intensive snoreline use and development.

Ecological Impact

These structures will stabilize sand or soil on their landward side. This makes greater development of vegetation possible.

Breakwaters will change the ratio and mechanical/solar energy affecting the structure of the marine or aquatic community between the breakwater and the shore. A reduction in the proportional amount of mechanical force from the waves, tides or currents will probably result in an increase of submerged vegetation.

These structures may reduce biologically-active "edge" and thus reduce basic productivity of the waters. However, since they also serve as shelter, places of attachment, and feeding areas for fish and invertebrates, they may thus increase total biological productivity of the area.

Sand Fill-Beach Stabilization: Sand fill is the placing of sand and other fill materials on or near the existing beaches, dunes or shorelines. The fill is often taken from dredging an adjacent water body. Beach stabilization consists of planting and other stabilization measures to hold these fill materials as well as existing dunes and shorelines materials in place. This process eliminates erosion, reduces flood damage and increases access potential. The use of these devices is partly controlled by existing conditions such as elevation, topography and the width of the beach area. They

may be temporary corrective measures counteracting natural forces.

Visual Impact

The enlargement of the beach surface and the improved alignment is more uniform, often more appealing and can unify diverse patterns and elements along the adjacent land area.

The combination of plants used in beach stabilization and the sand beach areas often produce attractive compositions.

Existing visual misfits are often eliminated.

Cultural Impact

Access to the beach area is improved and its recreational potential increased. Protection for land uses adjacent to the waterfront is provided.

Ecological Impact

Beach stabilization will assist in the stabilizing of erosion by promoting a lasting vegetative community.

Sand fill may reduce biological activity offshore if fill material is dredged or pumped from the area.

CATEGORY C: BUILDING AND OTHER LARGE STRUCTURES

This category includes free-standing buildings and related large structures and/or complexes related to water use or water processing such as: power generating plants including conventional thermal, pumped storage and nuclear plants, waste treatment-water renovation plants, desalination plants and offstream cooling plants. The structures are large and dominant in relation to the individual and to the surrounding landscape. They present a complex visual image composed of many parts. A relatively flat site for major construction is required and this is normally near or at the edge of a water body.

Power Generating Installation: This device consists of brick, concrete or metal buildings and structures with power line connections, waterfront connections, fuel storage areas, tall smoke stacks, generators and other elements which comprise a power generating unit. Size, com-

plexity and location are key elements in the determination of its impact upon the landscape. Conventional thermal, pumped storage and nuclear plants are discussed collectively in this section. Individual differences are pointed out where necessary. These devices are used in most Series and Units but are not frequently found in Mountain Series in the NAR.

Visual Impact

The plant can be seen from great distances because it is usually located on flat landscapes and adjacent to an unobstructed open space (water body).

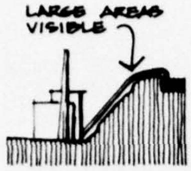
Power plants are visually acceptable from distances of a mile or more by acting as a counterpoint or accent to large areas of natural or man-made landscape. Because of its size, dominance and complexity, the plant can create visual interest and excitement when the viewer is in close contact and all, or most of the view is directed at the structure itself.

Power plants are most detrimental to visual quality when viewed from the middle distance. At this distance natural land forms are seen in strong contrast to the structures and their frequently attendant clutter.

These installations can be detrimental to visual quality when they disrupt the continuity of a shoreline, emit air and water pollutants and are designed and constructed without regard for the relationship of the structure to its surroundings. Detrimental aspects can be minimized by orienting the total structural complex so as to occupy as little water front as possible.

They are frequently constructed away from dense concentrations of people and therefore are seen in strong contrast to natural forms and materials.

Nuclear plants, although large, have a more unified and less distracting visual impression than fossil fuel plants due in part to the absence of large stacks and a generally uncluttered structural appearance, and because major fuel supply yards and ash disposal facilities are eliminated.

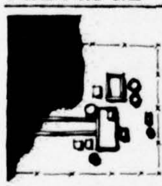


Pumped storage plants visually affect larger areas than other power plants because of their necessary location adjacent to hillsides, the need for high elevation reservoir storage and the resultant scarring of the hillsides.

Power lines detract from the landscape when they appear as the only structural element in large open areas and when they have no formal relation to existing landforms. The detrimental aspects can be reduced by relating power line alignment to the land form rather than to arbitrary straight lines across rolling and curving landscapes.

Smoke stacks are normally elements of strong contrast when located in open areas and can serve as points of identity and reference. They are not visually detrimental by themselves except when in conflicting relationship to other vertical structures or producing air polluting emissions.

Cultural Impact



Power plants often limit the use of large portions of waterfront. They also may limit the use of the water body through such practices as the discharge of large quantities of water.

Power plants often affect land values and the use potential for large areas of the land within view of the plant.

Ecological Impact

The most significant proven impact of thermal power plants is from waste heat discharge. Raising average water temperatures has a general effect of accelerating eutrophication. The most predictable changes are a reduction of oxygen levels and a more rapid release of mineral nutrients. This may result in a loss of fish and other animal life, and the promotion of rapid plant growth. If the temperature change is great, a loss of most plant and animal life may occur.

Changes in water temperature may produce local microclimatic disturbance in the form of increased fog, higher humidity and the extension of frost-free dates during both the spring and fall.

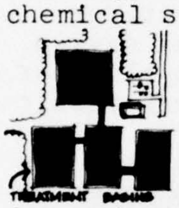
Pumped storage plants greatly influence flow pattern on a daily basis.

Surges in stream flow during hours of power generation may produce continuous channel erosion downstream from the outfall.

Daily periods of increased flow may disturb bottom flora and fauna and reduce productivity of the aquatic environment.

Depending on the design of the intake, it may cause direct destruction of fish life.

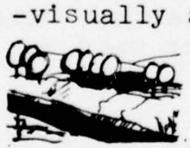
Waste Treatment - Water Renovation Installation: Waste treatment complexes are composed of buildings, holding, aeration and settling tanks, filter beds, chemical supply and other structures. They are



generally smaller in size than power generating plants and require land areas of one to several acres. The most outstanding features are the water treatment basins or tanks and the building itself. Size, location and design are key elements in the determination of visual, cultural and ecological impact. This device is most often used in the Intermediate City, Fringe City, and the Town-Farm Units.

Visual Impact

The visual impact is typical of many smaller industrial or commercial buildings - rectangular in form with a simple horizontal, low silhouette -visually affecting a relatively small area.



Architectural design quality and plant location are both important elements in determining the visual impression.

Water storage bodies and aeration jets can contribute in a positive way to the general visual impact.

Cultural Impact

The facility can provide the impetus for additional community growth by the provision of increased water supply for industrial or other growth needs.

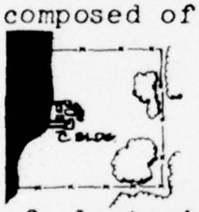
Increased quantity and quality of the water encourages other uses such as swimming or irrigation.

Ecological Impact

General water quality can be improved through the removal of suspended solids and toxic materials. Greater sunlight penetration will result which promotes plant growth and creates a more productive food base for the entire aquatic community. Removal of solid organic materials will reduce the oxygen demand made by the bacteria of decay. Dissolved oxygen levels favorable to aquatic plants and animals will be maintained.

Unless tertiary treatment is provided, nutrients (nitrogen and phosphorus) which without treatment would be dispersed throughout the service area may be discharged at a single point. Higher nutrient content in the water may promote rapid plant growth. If this occurs at rates in excess of the rate or organic breakdown of dead material, then an oxygen deficiency may result. If take up and recycling of nutrients is accelerated, eutrophication may result.

Desalination Installation: This device for the extraction of salts and other materials from sea water is composed of buildings, fuel storage facilities, exhaust stacks, water connections, reservoirs and machinery and equipment complexes. The buildings are normally small and not a dominant part of the complex. However, much of the processing equipment is exposed. There are many types and forms of plants in experimental stages and flexible sites are required for anticipated increases in size or form. Presently they are being used only where serious water shortages exist. This device is most often used in Coastline Series.



Visual Impact

The plant complex is often composed of repetitious units which are more complex, mechanical and scientific looking than other water use or processing devices and are more interesting to view.

The plant can be seen from great distances because it is usually located on flat landscapes and adjacent to an unobstructed open space (water body).

These installations can be detrimental to visual quality when they disrupt the continuity of a shoreline, emit air and water pollutants and are designed and constructed without regard for the relationship of the structure to its surroundings. Detrimental aspects can be minimized by orienting the total structural complex so as to occupy as little waterfront as possible.

Cultural Impact

A desalination operation can control or extensively limit future development within an area deficient in water resources by witholding or controlling the amount of usable water provided.

The plant can consume large portions of level land along the coast.

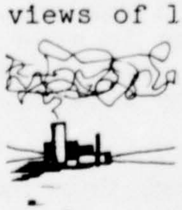
Ecological Impact

Ecological impact could be severe but conditions vary so much from site to site that generalizations cannot be made.

Off-Stream Cooling Installation: This device for cooling water is used in combination with thermal and nuclear power plants. The installations, dominant features on the landscape, are composed of extremely large towers of simple form and of associated minor buildings. Facilities are located near a water body and require relatively flat sites for construction. Size, location and climate are all important factors in determining the visual, cultural and ecological impact. The device can be used in any Landscape Series.

Visual Impact

The devices are dominant, monumental forms in size, outline and proportions and often block or eliminate views of large portions of the landscape.



They effect views of the sky over a large area through the creation of steam clouds above and around the installation.

The area in which the device is visually

dominant is normally large because of the scale of the tower and its usual location on a flat portion of the landscape.

Cultural Impact

These devices often limit the use of large portions of waterfront.

Because of their size, cost and function, they exercise a permanent limitation or control on the use of a large area.

They often affect land values and the use potential for large areas of the land within view of the plant.

Ecological Impact

They also create fog, and the rain and fog could affect the local micro-climate. Open-type, salt water cooling towers cause a salt-particle fallout which is highly detrimental to plants.

Dams and Hydroelectric Power Installations: These structures of varying size, shape, form, material and complexity are used to impede and control the flow of water in a water course. Dams serve many functions including flood protection, water supply and hydroelectric power generation and recreation.

Dams are large massive architectural forms of concrete, earth or rock, and can be the most massive of all water management devices. In plan, the form can be either simple and straight, giving a sense of rigidity, or curving and complex, providing a flowing quality. In elevation, the structure can be high and narrow (Mountain and Steep Hill Landscape Series) imparting a feeling of verticality, or low and wide (Rollin Hill or Undulating Land Landscape Series) suggesting horizontality. Earth fill dams have inclined facades while concrete dams have vertical or near vertical facades. The erection of a dam creates an impoundment which varies in size and form depending upon the type of landscape (e.g. Landscape Series), the availability of water, and the size of the dam.

Dams with hydroelectric facilities range from retention dams which are usually simple, single

purpose structures with few auxillary facilities to hydroelectric dams which are more complex, larger, multi-purpose structures with many auxillary facilities. Auxillary facilities include gates, by-pass tunnels, settling basins, power houses, power transmission lines and switches.

Dams are most often constructed in Mountain, Steep Hill and Rolling Hill Landscape Series.

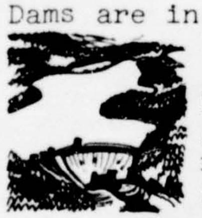
Visual Impact

Dominance and contrast between the dam and the landscape can be as great with a simple and straight form as with a curving form. This fit can be evaluated on the basis of the position, exposed materials and junction of the structure with the natural landscape.

The apparent visual form changes when the dam is viewed from different elevations. From below, the dam appears as a wall or building, from above as a dike, and its top as a road.

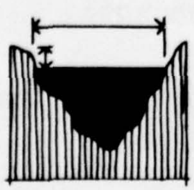
A design that contains architectural repetition of some major feature (power units, gates, etc.) adds shadow, scale and interest to the total structure.

Dams are in greater visual contrast with natural landscapes than with man-made landscapes.



Dams of concrete and steel are in greater visual contrast with the natural landscape than dams of earth, rock and natural materials.

Dams add water and open space to the landscape, thus expanding the view of the water and the surrounding landscape. This open space has greatest visual significance in contributing pattern in heavily vegetated landscapes such as Farm-Forest, Town-Forest and Forest-Wildland Landscape Units.



In Steep Hill and Mountain Landscapes, dams having a length greater than the height of the adjacent hills or mountains will change the dominant landscape dimension of that site from vertical to horizontal.

Higher dams offer more dramatic contrast than low dams because they are located in rugged and exciting topography. They can be seen from both far and near, but are most often seen suddenly and by surprise and are normally seen from either below or above, thus dramatically increasing the perceived height.

Low, long dams are more dominant but less dramatic in the landscape because they can frequently be seen continuously from a larger area.

Earth fill dams utilize more space in the landscape than concrete dams and are usually broader and more massive, yet less dominant in appearance.

Earth fill dams cause greater scarring of the surrounding landscape because of their need for large amounts of natural fill materials within a short distance haul.

Auxillary facilities can be visually unwelcome appendages or exciting counter-points and scale indicators, depending upon whether or not they are considered an integral part of the total design problem. If well planned, they will be integratéd with the major structure and not appear as unrelated appendages.

Cultural Impact

Existing vehicular and pedestrian circulation paths can be interrupted, forcing less convenient routes to be developed.

Dams can eliminate existing land use such as farming in the valley floor but also can stimulate new uses such as recreation or residential development which capitalize upon the water orientation.

Ecological Impact

Reduction of flooding downstream may lower the soil fertility of the flood plain and slow down soil formation.

The dams may inundate and eliminate unique ecological areas.

If water is used for low flow augmentation, there may be a general increase in the amount of channel erosion during periods when aquatic plant and animal life cycles are not adaptable to this phenomenon. Such a change in volume of flow and increased silt may destroy rooted aquatic plants, reduce sunlight penetration, reduce bottom dwelling animals or reduce the survival rate of immature fish.

If draw-off is from the low levels of the impoundment, downstream ecology may change from warm water to cold water (bass to trout). It is remotely possible that downstream eutrophication may be reversed. If draw-off is from the surface water of the impoundment, a reverse effect on the stream ecology may result. Either result assumes that levels of dissolved oxygen and mineral nutrients in solution are within tolerable limits for aquatic life.

CATEGORY D: MINOR STRUCTURES AND LARGE AREAS

This category includes facilities characterized by minor structures dispersed over large areas and includes recreation facilities, fish and wildlife facilities, ground water management facilities, drainage facilities, navigation facilities, waste disposal facilities and impoundments.

Recreation Facility: The following discussion is limited to the visual, cultural and ecological impacts of water-oriented recreational use of the landscape, and it will consider the character, location and design of recreational facilities. Recreation, with its employment of physical facilities is regarded as a pattern-modifying force on water and related land uses.

Water based physical recreational facilities such as slips, launching ramps, docks, piers, marinas, boat maintenance and storage buildings, boardwalks and embankment walls are considered. Also included are land based water related recreational facilities such as swimming beaches, picnic areas, camping sites, view clearances, maintenance yards, circulation and parking areas and athletic fields.

Recreation can be and often is a part of multi-use projects. The visual, cultural and ecological effects will be similar to those created by single purpose recreation projects if recreation is the dominant use. If recreation is a minor or secondary use

the effects upon the landscape will be generated mainly by other, more dominant use. See the discussion under preservation, Flood Plain Management, Fish and Wildlife Facility and Impoundments, and read jointly with this section when they are included in a multi-use project.

The demand for recreational facilities has increased significantly in recent years. Areal extent, intensity of use, type of landscape, access and climate are all important factors to consider in the determination of the visual, cultural and ecological impact. A large body of water (minimum of several acres) is necessary for the establishment of a successful water-oriented recreational development. Access and circulation are dominant and organizing factors in most recreational developments.

The accompanying facilities (including commercial enterprise and housing) of a recreational development are not always controllable. These accompanying facilities contain minor architectural structures which are normally simple geometric forms both in plan and elevation. Most often they require open areas with little or no vegetation or topographic features. These structures, whether on land or in the water are frequently located close to one another and are oriented to the shoreline.

Visual Impact

The addition of a public recreational facility to either an existing water body or an impoundment does not add a great deal of contrast to the landscape because the number of structures is limited, they are usually small, and the recreation activity uses the natural landscape as a major component in its composition.

The visual impression is strongly influenced by the manner in which arrival and departure points are established and by the way in which circulation is handled. The landscape context in which the facility is placed is equally important in creating a recreational atmosphere. People expect recreational areas to differ from their everyday environment.

Outdoor recreational facilities are most often located in natural or semi-natural settings. This atmosphere can have a strong effect on the success of an extensive outdoor recreational facility.

There are two distinct visual impressions imparted - one when the facility is in use and the other when it is not in use, both of which can be pleasant.

The open or semi-open space required for recreation expands both the number and the variety of the views.

People are a visually dominant and interesting part of recreational development.

Maintenance programs for high use recreation areas are important in maintaining visual quality.

Good design and proper site location of all components of a recreational facility are essential for quality visual fit.

Facilities on the shoreline disrupt the continuity of the shoreline, sometimes distracting greatly from the visual quality.

When seen from a distance a dense grouping of shoreline structures acts as a counterpoint in a natural landscape or as a midpoint in the transition from water to city in urban or sub-urban landscapes.

Cultural Impact

Heavily used areas create a significant land use change in the surrounding landscape by causing the growth of commercial enterprise to serve the participants of the recreation area.

Most recreation areas demand a compatible land use in the area adjacent to the site in order to maintain its desirability.

Water-oriented recreation is growing and its wide range of activities (swimming, power boating, canoeing, etc.) increases the possibility that conflicting uses of a recreational facility and adjacent areas will occur.

Ecological Impact

Intensive and general use recreation may substitute an urban or dominantly man-made environment for a natural one. This will favor the existence of plant and animal species less susceptable to human activity and extirpate those that cannot withstand it.

Heavily used sites, fragile land or wildland recreation areas may experience localized effects such as soil compaction, destruction or damage of low growing and ground vegetation, and the introduction of pollutants - organic wastes, motor fuel and oil. In campgrounds and picnic areas there may be a local concentration of insecticides in soil and water.

Fish and Wildlife Facility: This device is concerned with the management of water and related wetlands for the preservation of wildlife species that are in danger of extinction, for maintaining or improving the the quantity and quality of fish and game production, for educational research and scientific purposes, for recreation (photography, picnicking, hiking and wildlife observation), hunting and fishing, and for commercial fish and game production. It is often used in conjunction with other devices such as water supply facilities, recreation facilities, impoundments and physical-nonphysical devices such as preservation, flood plain management and watershed management.

The size of the area varies from a small pond to a large watershed and may include physical structures to maintain water levels and water quality. The impact of these facilities frequently is greatest on the ecological aspects of the landscape involved. The landscape most often utilized is natural, with the potential for fish and wildlife management.

The areas involved overlap political boundaries and control is exercised by numerous interested organizations.

Visual Impact

This device may create an important visual attraction in any landscape unit. It maintains quality in landscape pattern either by maintaining existing natural conditions or by adding water bodies which can create added diversity.

The sight of many forms of wildlife is a unique visual attraction which may draw large numbers of people.

Because its component parts (wetlands and water bodies) differ from those of the surrounding area, they contribute contrast and variety to the landscape and increase the number of views.

Cultural Impact

Normally, except in certain limited portions of the site, intensive use is restricted, existing extensive uses are maintained and landscape quality is preserved or improved.

These facilities require compatible surrounding land uses that are not noisy and that do not emit pollutants.

Increased fish and wildlife populations may create a more intensive use of the facility for activities such as hunting and fishing or wildlife observation.

Use is often sporadic, coinciding with fishing or hunting seasons or migration time for water fowl.

When used as a commercial enterprise such as pheasant, grouse or trout production, all other uses are eliminated or at best limited.

Ecological Impact

It may introduce new plants or animal communities to an area.

It may introduce exotic plants or animals to an area.

It may guarantee protection for existing communities of a unique or highly productive nature.

Since most fish and wildlife plans seek to create middle aged aquatic or terrestrial conditions because they are more productive of sport species, there may be a deliberate acceleration or reversal of the natural aging process. In the NAR it is more likely that fish and wildlife management would try to create younger or developmental terrestrial communities since most of the natural landscape has matured beyond the point of being productive of sport wildlife species.

Water Supply Facility: This discussion is concerned with the physical facilities involved in the supply of ground and surface water. These include pump stations, channels and pipelines, water towers, treatment plants and impoundments. Functions which these facilities perform involve the trapping of water, the extraction of water from existing sources, and the treatment and

distribution of water for domestic, industrial, power, agricultural, cooling and pleasure purposes.

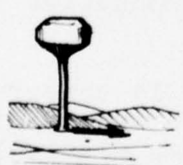
A surface water supply exists either in the form of a river or lake or it is created by trapping the water from rivers and streams behind dams. Increased demand and pollution problems are requiring more man-made water supply storage areas. The size of the water supply impoundment varies from small lakes to huge water supply systems which may include a series of impoundments containing millions of acre-feet of water. Distance between the source and destination of the water varies from direct use at the source to the transporting of water over hundreds of miles. The water is carried in underground or surface channels. The latter are either of earth or are paved.

Climatic conditions affect the water supply demand. In arid regions the water supply is utilized to maintain all vegetative growth, but in the eastern temperate climate the water supply for this purpose is needed only as a supplement to precipitation.

The greatest part of the NAR surface water supply comes from the Mountain and Steep Hill Landscape Series and Systems. Additional information can be found under the titles: Waste Treatment-Water Renovation Installation and Impoundments.

Visual Impact

Water that is stored a great distance from where it is used causes a continuous unbroken distruption of a portion of the landscape by the introduction of channels and pipelines on or below the surface. Natural rejuvenation in the NAR landscape normally eliminates the visual distraction caused by pipelines within a period of several years.



Water towers can be attractive focal and orientation points. They can be distractions or misfits when they are poorly designed and are poorly related to landscape form and pattern or to adjacent vertical structures.

Visual effects of dominance and contrast are not great and are also normally limited to the immediate surroundings.

Water supply is an important consideration in the development of industrial, commercial, residential and recreational areas. By controlling the amount of available water, growth and development can be encouraged or restrained to a limited degree.

Utilization of the watershed around those water bodies which are used for water supply is restricted to uses which do not affect the quality of the stored water. This area of limited use is large, sometimes as large as a landscape unit. As the demand for water increases, the watershed areas which have these restrictions will also increase significantly.

Ecological Impact

Some plant and animal communities are destroyed or interrupted by the placing of pipe lines.

See the discussion under impoundments if they are included as part of the water supply facility.

Ground Water Management Facility: Ground water management is defined as the controlled modification of the hydrologic cycle by artificial means or actions to achieve some desirable water use benefit. It is concerned with both surface and subsurface water. It is used in river basins for flood control, water supply, water quality control, flow augmentation, ground water recharge and return, maintenance of ground water level, prevention of salt water encroachment and salinity control. Ground water management devices include drilled wells, pit lagoons, spreading basins, canals, gallery collection and ground water lakes. They are most effective when used in combination. In this way they are better able to meet changing water conditions.

Ground water management involves large areas which often overlap political boundaries, even several Landscape Series and Units. The three types of aquifiers; coastal plain, glacial drift and consolidated rock are in different locations within the NAR and require different types of devices to accomplish their management purposes.

Visual Impact

The visual impact of ground water management is

minimal unless ground water lakes are created or water flow is materially changed.

Ground water lakes develop strong contrast with their surroundings and add to the visual interest and quality of a particular landscape.

Flow augmentation could enhance both the quality of the water and the interest it creates during the summer months when many people can enjoy it.

Recharge wells are effectively used in the headwaters of major NAR rivers. They are very small and require minimal amounts of land. Their visual impact is minimal except for access roads and minor buildings.

Gallery collections and pit lagoons normally cause alteration of existing land forms and are occasionally obvious distractions.

Cultural Impact

Ground water management can dispose of storm water or treated effluent without causing flood damage from stream discharge.

Ground water lakes add to the land value and to the intensity of use of the land surrounding them.

Domestic sewage tank disposal has long served as an effective means of ground water recharge and as a disposal function at the same time.

Odors from large area effluent recharge can become obnoxious in densely populated areas where they are most used and needed and can reduce value and limit use of the surrounding land.

Ground water management for aquifiers near the surface could influence land use patterns by placing restrictions on the type and design of the uses over these aquifiers.

Ecological Impact

Where ground water lakes are created, entire new ecosystems are introduced in the water and in the adjacent land. The new water table materially affects the wildlife carrying capacity of an area.

Ground water management that encourages development of old age water conditions may reduce water quality drastically and alter the ecosystem of that area.

Drainage Facility: The following covers the impacts of drainage upon agricultural and related land uses. Drainage is defined as the removal of excess water by artificial means or, as the retarding or slowing down of rapid surface drainage to prevent erosion. Pipes, granular materials, ditches, sodding and other ground covers, tree planting, outlet pipes and other small structures are physical techniques used to accomplish the task.

Over half of the nation's surface contains excess water which prevents productive agriculture and related land uses. Drainage problems occur sporadically throughout all of the Landscape Series and Units of the NAR and affect large areas as well as small. Drainage is used in conjunction with almost every type of land use. It can be accomplished by surface or subsurface means.

Drainage most often involves the minipulation of natural materials and forms. The character of the area involved, the severity of the drainage problem and the regenerative capacity of the landscape all control the ultimate visual, cultural and ecological impact. The visual and cultural effects are more the result of the intensified or altered use of the areas improved by drainage than of the drainage devices themselves.

Visual Impact

Drainage allows intensive agriculture and other types of land use which generally increase landscape diversity or interject new elements into landscape pattern. If agriculture is already present, it may decrease landscape diversity by the loss of wetlands in exchange for more farmland.

The addition of a drainage facility does not add significant visual contrast to the landscape; it tends to blend with the landscape because of the predominant use of natural materials.

Drainage will change the type of plant material a particular piece of land can support.

The surface ditches often encourage adjacent vegetative growth which, in combination with the ditch, create dividers and enhance pattern in the landscape. Crop variety in the adjacent fields can often strongly emphasize these dividers. The total result is increased visual variety.

Drainage that prevents erosion problems is an automatic step to increased visual value.

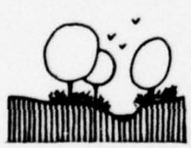
Drainage often results in permanent ponding in low points adjacent to the drained land. These ponds serve as focal points.

Subsurface drainage normally causes minimal visual changes to the landscape except where major areas of vegetation are removed.

Paved drainage ditches in heavy run-off areas can be a strong visual contrast, and a "misfit" in a natural setting.

Drainage often requires minor and occasionally major change to the earth form and slope. The more dramatic this change the more distraction is created.

Cultural Impact



Drainage ponds offer potential for recreational use.

Surface drainage ditches may add habitat for fish and wildlife, increasing the possibilities for hunting, fishing and nature study. The "edge effect" along surface drains is often excellent game bird habitat.

The drainage of land facilitates circulation and access to that land.

Drainage represents an improvement and an investment in the land that requires the new use to yield a higher return. The withholding or implementing of drainage facilities can serve as an important control on land use.

Ecological Impact

Ecological impact, both terrestrial and aquatic, is

determined not as much by the drainage method used as by the areal extent of land involved and the amount of water displaced.

In the NAR the ecological impact of drainage is strong because it affects large areas.

Whenever excess water is removed from one area and deposited in another the terrestrial and aquatic conditions of both areas change. Normally the change exists only as long as the drainage facility is active and natural conditions return after an intervening time period.

Navigation Facility: This discussion considers navigation on inland waterways and includes commercial navigation but not recreational boating. It is concerned with navigation facilities placed on a water body or on the adjacent land. The major physical devices employed are locks and their attendant dams, docks and piers, channel excavation and turning basins.

These devices are utilized on large waterways and harbors. The installations are relatively permanent and make navigational contact with major metropolitan areas possible. Locks and dams are permanent concrete and/or earth-filled structures created to provide adequate depth for navigation and to reduce the velocity of the water flow in order to move boats more easily. They are large, solid, normally linear in form and composed of several parts. They are used most often in Undulating Land and Flat Land Series.

Visual Impact

Because locks reduce velocity and increase depth, they often remove exciting rapids and waterfalls and decrease visual interest.

The impoundments and water storage areas created above the lock and dam change the character and visual impression of the water far upstream. Most often the water body, although larger, is less interesting because water flow is slower.

The locks are composed of several parts but in mass are simple, low silhouette structures which offer minimal contrast when viewed from a distance.

Boats that are large in relation to a river or channel are exciting visual phenomena and provide a strong contrast by both their form and size.

Cultural Impact

Navigational use may limit other uses of the water course such as fishing, swimming and boating.

Tourists as well as local residents are attracted to commercial water courses because of the visual interest they offer.

Ecological Impact

Depending upon flow characteristics of the river at its mouth, improvements for navigation through excavation may shift estuarine conditions upstream. This is most likely to occur when the natural gradients of the stream are steep and when the excavation reduces them in deepening the channel.

Construction of piers, bulkheads and dockheads may reduce fish and shellfish habitat or fish breeding areas by changing the configuration of the bottom and the banks and by the removal of natural bottom and bank materials and their replacement by other materials.

Solid Waste Disposal Facility: There are four basic methods for the disposal of solid waste materials. They are: open face dumps, sanitary land fills, compaction and incineration. The residual material from compaction and incineration go into sanitary land fill.

The quantity of waste is increasing rapidly. The 1980 estimate of 270 million tons per year for the United States is almost double that of 1968. The physical composition of waste is also changing. There is a decrease in moisture and in materials that decay and an increase in plastics and paper. New equipment and facilities are being designed to deal with the waste disposal problems.

Waste disposal costs increase with the increasing distance of the facility from the urban centers that it serves. Facilities are sited most often in Fringe-City, Town-Farm, and Forest-Town Landscape Units.

Open Face Dump and Sanitary Land Fill: Open face dumps and sanitary land fill have been the traditional methods of solid waste disposal in this country. They involve the dumping of solid waste in a natural or man-made depression in the earth followed by backfilling with soil to produce a new usable land surface. They normally cover no more than several acres and are located near the populated areas. Open face dumps are considered unacceptable because they often pollute the air through burning, cause odors, pollute water, attract rodents and are left exposed for long periods of time. Sanitary land fill sorts the waste products, does some compacting, allows no burning, takes precautions to guard water supplies and covers the waste immediately with earth.

Visual Impact

These facilities are unsightly. Smoke and odors increase significantly in the area around an open face dump.

The land chosen for dumps or land fills are often wetlands of significant visual and wildlife habitat value.

Sanitary land fill, when properly designed, can alter large areas (land reclamation) with a positive effect in terms of potential use for permanent open space or parkland.

As waste disposal demands increase or as new regional approaches to disposal materialize, larger contiguous areas will be needed to make a dump operation feasible. This increase in size will create far more visual disturbance.

Cultural Impact

Open face dumps can pollute air and water and bring disease.

The impact of open face dumps and sanitary land fill can sometimes be severe. They can reduce surrounding land values and to some extent control land use in their surroundings.

Both dumps and land fill create land suitable for more intensive development which is often quite

valuable and central to urban areas.

Open face dumps are very likely to be "misfits" in any landscape. Sanitary land fills are likely to be "misfits" while they are in operation only.

Ecological Impact

Open face dumps and improperly designed sanitary land fills can cause both water and air pollution. The degree and character of the ecological impact, and the area of influence are dependent upon the existing physiographic site conditions, the management of the facility and its placement in relation to wind and water movements.

Disease is often a problem. Rodents and insects can carry diseases that affect man's food plants, his animal's health and his own health.

Compaction and Incineration: These two methods of waste disposal by volume reduction processes are relatively new but promise to be efficient and effective ways of dealing with waste problems. When adequate air pollution control devices are used, incineration has proven to be an effective method.

Compaction transfer plants and incinerators are normally located near large cities. They are both satisfactory for regional or combined industrial group approaches to waste disposal. Incineration is able to reduce the volume of solid waste by 64%. The residual 36% is disposed of by sanitary land fill.

Visual Impact

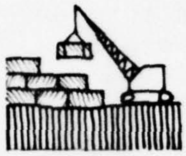
The smoke stacks associated with incineration plants (up to 600 feet in height) are normally elements of strong contrast when located in open areas, and are points of identity and reference. They are not visually detrimental by themselves except when in conflicting relationship to other vertical structures or when emitting obvious air pollutants.

Transfer buildings and compaction plants are smaller than incinerators and their visual impact is similar to water renovation plants.

Cultural Impact

Rail haul of compacted waste or residual incineration

material provides promising potential for the movement of solid wastes and for large scale land reclamation. Of particular significance is the potential for filling large derelict open-pit mines.



Compacted waste encased in asphalt or concrete has potential to become effective building blocks for large buildings or constructions such as airports, dams, dikes and levees, weirs, groins, and for bank protection.

Ecological Impact

Since compaction and incineration are relatively new methods of disposal and since technology is quickly advancing, generalizations on the amount of ecological impact should be concerned with specific installations.

Impoundments: An impoundment is a man-made and controlled body of water devised to serve one or more functions such as recreation, water supply, waste treatment storage, water power, water cooling, and run-off detention and control. Normally impoundments are established in conjunction with an existing water course and are created by impeding the flow with a dam, weir, lock or dike. The size of the impoundment depends upon the yield potential of the watershed. They vary in size from very small (¼ acre) to several hundred square miles. With the possible exception of flood retarding impoundments, they are a relatively permanent phenomenon.

The water is a unique element with characteristics that are contrasting in almost any landscape setting. The water level may be either variable or constant. The shoreline configuration differs depending upon the existing topographic, climatic and vegetative conditions. Access to the water is normally excluded from at least a portion of the shoreline (where the control structure exists).

Impoundments are most often found in Mountain, Steep Hill and Rolling Hill Series. See additional discussion under Dams.

Visual Impact

In the NAR, impoundments usually establish a good fit with their surroundings and tend to become naturalized in appearance.

The more rugged the topography the more dramatic the views and the greater the contrast with the horizontal water surface.

A variety of uses can be accomodated more readily on a very irregular shoreline without creating conflicts than on a regular shoreline. This is because the jagged shoreline creates visual barriers between the various areas.

The more irregular the shoreline is horizontally

and vertically the greater the visual interest and impact. Interest is often lost in a continuous, uniform, monotonous shoreline.

Two major variables are the location of the impoundment and the water level. These affect the visual proportions that exist between the water surface and the surrounding topography and/or vegetation. These variables also affect the amount of visible exposed embankment.

Impoundments that are used in quantity and that cover three to five percent of the total land area with uniform distribution can change the existing visual impression to that of a water-oriented landscape and may well improve its quality ranking.

The visual impact of an impoundment is largely determined by when, where and how it is viewed. The visual surprise afforded by small narrow views as contrasted with that of large open panoramas, the providing or withholding of views, the changing of the viewer's relation to the water edge (above, parallel, close or distant), when considered as part of the design problem, can increase the visual impact of the smallest impoundment.

Impoundments alter the visual quality of the stream or river below the impoundment by controlling the amount of water discharged and by determining whether or not the flow is uneven or continuous.

The water has reflective qualities that echo the sky and surrounding landscape, bring new colors into the landscape and connect the ground and the sky.

Water provides motion in what might otherwise be a static landscape.

Cultural Impact

Impoundments change land use, land values and vehicular and pedestrian circulation patterns in the surrounding area. When permitted by management policy, they will attract new water and water-related land uses. The larger the impoundment the greater the changes that may be expected.

A large impoundment with a greater range in water depth will tend to bring about more intense use of the impoundment than a smaller one with less change in depth.

The heated water of water cooling impoundments could be used for swimming and could prolong the swimming season.

Water treatment and water renovation impoundments may offer some visual value but do not provide secondary uses.

Ecological Impact

Unique natural areas might be flooded by the creation of an impoundment.

Impounded water may undergo a rise in average temperature changing from a cold to a warm water ecology.

Reduction of periodic flooding may reduce alluvial deposition on the flood plains. This may result in diminishing natural soil fertility, a loss of plant communities which are dependent upon periodic flooding or a lessening of stream bank erosion.

Depending upon surface/volume ratio, on surface/depth ratio and on whether draw-off is from upper or lower levels of the impoundment, downstream reaches may undergo mineralization and a change in temperature. This could change the ecology from cold to warm water or vice versa, or accelerate or possibly reverse biological aging (eutrophication).

SECTION VI: RIVER BASIN SUMMARIES

INTRODUCTION

The purpose of this chapter is to provide a summary of the visual and cultural inventory and needs of each basin. The text summarizes the more significant attributes of the basin such as a preponderance or lack of high quality landscape, homogeneity or diversity of land form and landscape patterns, significant features and the major visual and cultural needs. Significant features include free-flowing rivers, which are rivers or portions of rivers that are still unmodified by man or that retain natural scenic qualities, and cultural sites such as Sturbridge Village, Massachusetts or clusters of historical sites.

The landscape inventory data are listed by Series and Units and given in square miles. Needs, devices and costs are listed sequentially. Only those needs relevant to the basin in question are listed. The needs are given in either square miles or percent of the basin. They are given by bench mark years for both the environmental quality objective and the national efficiency objective.

Devices are broken down into two categories. First is legal devices which have been used for determining costs and second is other devices. The other devices are those which support the visual and cultural needs but are primarily used for other needs such as flood control, water supply or erosion control. The other devices have not been included in the cost figures.

Costs are given as first cost, annual cost and annual return where appropriate. First cost includes fee simple purchase, easements and purchase for lease back. Annual costs relate to tax incentives or subsidies and annual return relates to the expected return from the lease back arrangement of the purchase-lease back device.

Historic, archaeological and natural sites of state, regional and national significance are presented in tabular form. The tables for historic and archaeological sites include the site name and date, location, area, type and class. Not all information is available for all sites. Class refers to: National Park Service Site, National Historical Landmark, State Historic Monument and Other Private or Quasi-public sites. Class

abbreviations which appear in the tables are in order: NPS, NHL, SHM and OTH. The type designation with the exception of building complex is taken from The National Register of Historic Places 1969. It defines the major site attributes and consists of building, building complex, structure, site and district. The types are defined as follows:

Building - a structure created to shelter any form of human activity

Building complex - a cluster of several buildings

Structure - a work constructed by man

Site - the location of an event, building, structure or object.

District - a geographically definable area, urban or rural, possessing a significant concentration or linkage of sites, buildings, structures or objects unified by past events or aesthetically by plan or physical developments.

The abbreviations which appear in the tables are, in the above order: BLDG, BLPX, STRT, SITE and DIST.

The listing of sites of natural and scientific areas of national, regional and state significance has been gleaned from several sources. Most of the sites selected were from Parks for America, National Park Service, 1964. This publication is the result of a survey of parks and related resources in the United States and of potential sites which might be used for future development. Both existing and potential sites were included in the present listing. Only areas which contained significant geological, biological and wildness features are included in the basin summary lists.

All sites declared eligible as National Natural Landmarks have also been incorporated into the listing. And finally, all national (but not state or local) Audubon Society areas are also included.

Each basin is listed separately and sites are ordered alphabetically according to location and then site. Description of the site includes name, location, area in acres, significant features and class. Significant features are abbreviated in the lists as follows:

biological - bio, geological - geo, and wildness - wild. Class refers to the way a site has been classified or to the agency responsible for its administration. The classes and their abbreviations are as follows: National Park Service - NPS, National Recreation Area - NRA, National Fish and Wildlife - NFW, National Forest Systems - NFS, State Parks - SP, State Natural (or scientific) Area or Monument - SNA, National Natural Landmark - NL, Other Private or Quasi-public sites - OTH, Audubon Society - AUD, and potential areas, as suggested in the Parks for America inventory - POT. Because of limited available information, Natural Landmark and Audubon listings are not as completely described as the other categories. For those sites which overlap river basins, the areal figures given are approximations.

Several state agencies also submitted lists of statewide significant sites which have been listed separately at the end of each basin summary. Where published natural area inventories exist, this fact has been noted in the text.

BASIN 1

The entire basin consists of rolling hills. There is little diversity in pattern with over four-fifths of the area in Forest-Wildland and the remainder farmland.

Population density averages 14 persons per square mile (1960 census).

Free flowing streams include 40 miles of the St. John River and 8 miles of the Allagash.

The visual quality of the basin is medial, less than one percent is of high quality. The extent of wilderness in the basin is unique in the NAR however, and its remoteness (more than five hours driving time from any metropolitan center) makes it one of the largest, least accessible and most primitive geographical units east of the Mississippi. The major need for this basin is the preservation of 6000 square miles of unique wilderness quality landscape.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Rolling Hills	7300 sq.mi.	Farm	1300 sq.mi.
		Forest-Wildland	6000 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 1

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Preserve Unique Landscape(sq.mi.)	6000			6000		
LEGAL DEVICES						
Fee Simple (sq.mi.)	4800			4800		
Zoning (sq.mi.)	1200			1200		
OTHER DEVICES						
Water supply	x			x		
Preventive Flood Plain Management	x			x		
COST IN $MILLION						
First Cost	22.0			22.0		

NATURAL AREAS

SITE	LOCATION	AREA	SIGNIFICANT FEATURE	CLASS
Borestone Mountain Sanctuary	Maine			AUD
Fish River Lakes Region	Maine	1500 A	bio, geo	POT
Squapan Lake	Maine	1590 A	bio	POT

BASIN 2

While predominantly a Rolling Hills landscape, this basin is also represented by small amounts of the Mountain and Steep Hills Series. The predominant pattern is that of Forest-Wildland. About one-fifth of the region consists of Forest-Town Units and less than one percent is farmland. Water bodies cover 7 to 9% of the surface area of all of the Forest-Town Unit and approximately 4400 square miles of the Forest-Wildland Unit. (This totals three-quarters of the basin.) Nearly three-fourths of the region is of high overall quality and the remainder is of medial quality.

Population density for this area averages 17 persons per square mile (1960) and one-quarter of the total population lives in Bangor.

The first-ranking landscapes, the wilderness quality and the high incidence of water surface are of major importance in this basin. Unique plant associations such as the spruce-fir and bog communities occur in the wilderness area. Needs in this basin include the preservation of unique natural landscape and the protection of quality landscape.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Mountain	1100 sq.mi.	Forest-Town	2000 sq.mi.
Steep Hills	400 sq.mi.	Forest-Wildland	6500 sq.mi.
Rolling Hills	7200 sq.mi.		

NEEDS, DEVICES AND COSTS - BASIN 2

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Preserve Unique Landscape (sq.mi.)	750			750		
Protect Landscape Quality (sq.mi.)	1600	1600	1600	1600	1600	1600
LEGAL DEVICES						
Fee Simple (sq.mi.)	1250	500	500	50		
Easements (sq.mi.)	500	500	500			
Zoning (sq.mi.)				700		
Zoning and/or Tax Incentive-Subsidy (sq.mi.)	600	600	600	1600	1600	1600
OTHER DEVICES						
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	12.8	7.0	7.0	0.3		
Annual Cost*	0.1	0.1	0.1	0.4	0.3	0.3

* Annual costs assume that lands classified under Zoning and/or Tax Incentive-Subsidy will be acquired only by Tax Incentive-Subsidy.

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Baxter State Park	Maine	193,254 A	bio,geo wild	SP
Mt. Katahdin	Maine			NL

Additional sites identified by the Maine Department of Inland Fisheries and Game

SITE	LOCATION (COUNTY)	FEATURE
Jo-Mary Mountain	Piscataquis	Waterfall and gorge
Tumble Down Dick Stream	Piscataquis	Waterfall and brook

BASIN 3

Rolling hills cover about half of the basin and the other half is equally divided between Steep Hills and Mountains. Approximately ten percent of all of the Mountain Series in the NAR is found here. Nearly half of the basin is in Forest-Town landscape. Within this Unit, 7% of the surface is covered with water bodies. The other Unit pattern in the basin is Forest-Wildland and 3 to 4% of this surface area is also covered by water bodies.

Population density (1960) was 25 persons per square mile.

The overall visual quality of 90% of the basin is high -- the remainder is of medial rank. The abundance of water surface is a significant aspect of the character of the basin. The protection of quality landscape is the major need for this region.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Mountain	1200 sq.mi.	Forest-Town	2600 sq.mi.
Steep Hills	1300 sq.mi.	Forest-Wildland	3000 sq.mi.
Rolling Hills	3100 sq.mi.		

NEEDS, DEVICES AND COSTS - BASIN 3

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Protect Landscape Quality (sq.mi.)	1600	1600	1600	1600	1600	1600
LEGAL DEVICES						
Fee Simple (sq.mi.)	500	500	500			
Easements (sq.mi.)	500	500	500			
Zoning and/or Tax Incentive-Subsidy (sq.mi.)	600	600	600	1600	1600	1600
OTHER DEVICES						
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	18.0	18.0	18.0			
Annual Cost*	0.2	0.2	0.2	0.6	0.6	0.6

* See Footnote for Basin 2

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Maine			
Blaine (James G.) House, c. 1830	Augusta		BLDG	NHL
Fort Halifax, 1754	Winslow		BLDG & SITE	NHL

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Belgrade Lakes Region	Maine	3000 A	bio	POT
Lily Bay State Park	Maine	1000 A	bio	SP
Moosehead Lake - West Shore	Maine	1000 A	bio	POT
Mt. Blue State Park	Maine	4921 A	bio	SP

Additional sites identified by the Maine Department of Inland Fisheries and Game.

SITE	LOCATION (COUNTY)	FEATURE
Mount Kineo	Piscataquis	Cliff area with unique mineral deposits and a great abundance of Indian artifacts.
Lobster Lake	Piscataquis	Unique vegetative cover of pitch pine.
Grand Falls	Somerset	Waterfall on the Dead River
Stony Brook Gorge	Somerset	Scenic gorge
Moxie Falls	Somerset	90 foot waterfalls on the Moxie Stream
Spencer Gut	Somerset	Spencer Stream
Kennebec River	Somerset	Wild, scenic river, a well-defined corridor from Harris Dam to The Forks

BASIN 4

Nearly half of this basin is in the Mountain Series. The remainder is nearly equally divided between Steep Hills and Rolling Hills. Two Unit patterns occur within nearly three-quarters of the basin: Forest-Wildland and slightly over one-fourth Forest-Town. Seven percent of the Forest-Town surface area is water.

The population density averages 38 persons per square mile (1960).

Fifty-six miles of The Diamonds is classified as a free flowing river.

The outstanding quality of the landscape and the high frequency of water surface are important elements. The entire basin is of high quality landscape. The sole National Wilderness Area in the NAR, the Great Gulf Wilderness Area in the White Mountains National Forest is located in this basin. Remote, and of rugged topography, the Great Gulf rises from the valley between Mt. Washington and the Presidential Range. Mt. Washington combines features of both biological and geological significance. Needs include the immediate preservation of unique natural landscapes and the protection of quality landscape.

An inventory of scientific areas for New Hampshire describing 41 significant sites was published in 1963. It is titled Natural Areas of New Hampshire Suitable for Ecological Research, by Charles Lyon and F. Herbert Bormann and is published by Dartmouth College Department of Biological Sciences.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Mountains	1300 sq.mi.	Forest-Town	1000 sq.mi.
Steep Hills	1000 sq.mi.	Forest-Wildland	2400 sq.mi.
Rolling Hills	1100 sq.mi.		

NEEDS, DEVICES AND COSTS - BASIN 4

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Protect Landscape Quality (sq.mi.)	1100	1100	1100	1100	1100	1100
LEGAL DEVICES						
Fee Simple (sq.mi.)	400	400	400			
Easements (sq.mi.)	400	400	400			
Zoning and/or Tax Incentive-Subsidy (sq.mi.)	300	300	300	1100	1100	1100
OTHER DEVICES						
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Management, Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	14.5	14.5	14.5			
Annual Cost*	0.2	0.2	0.2	0.5	0.5	0.5

* See Footnote for Basin 2

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NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Grafton Notch	Maine	5700 A	geo	POT
Rangeley Lakes State Park	Maine	695 A	bio	SP
White Mountains National Forest	Maine	41,004 A	bio,wild	NFS
Crawford Notch State Park	N.H.	5950 A	geo	SP
Great Gulf Wilderness Area	N.H.	5400 A	bio,geo wild	NFS
Humphrey's Ledge State Scientific Monument	N.H.	36 A	geo	SNA
Madison Boulder State Scientific Monument	N.H.	17 A	geo	SNA

BASIN 5

Approximately three-fourths of the basin consists of Rolling Hills and one-fourth is Steep Hills. Two-thirds of the basin consists of Forest-Wildland and one-third is Forest-Town Unit pattern. There is, however, a highly significant amount of inland water surface in both Units; 14% in the Forest-Town Unit and 10% in the Forest-Wildland Unit.

The population density averages 26 persons per square mile (1960).

The entire basin is ranked as of high landscape quality. The contribution of the coastline in providing diversity, vistas and edges makes it a highly significant factor in visual quality. Forty miles of the Machias River is classified as a free-flowing stream. Needs include preservation of unique natural landscape and the protection of quality landscape.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Steep Hills	1100 sq.mi.	Forest-Town	1600 sq.mi.
Rolling Hills	3600 sq.mi.	Forest-Wildland	3100 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 5

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Preserve Unique Landscape (sq.mi.)	400			400		
Preserve Coastline (linear mi.)	400			400		
Protect Landscape Quality (sq.mi.)	1100	1100	1100	1100	1100	1100
LEGAL DEVICES						
Fee Simple (sq.mi.)	750	350	350	400		
Fee Simple (Linear mi.)	400			400		
Easements (sq.mi.)	350	350	350			
Zoning (sq.mi.)				550	550	550
Tax Incentive-Subsidy (sq.mi.)				550	550	550
Zoning and/or Tax Incentive-Subsidy (sq.mi.)	400	400	400			
OTHER DEVICES						
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Watershed Managmt., Agricultural Practices	x	x	x	x	x	x
Watershed Managmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	72.5	41.5	41.5	31.0		
Annual Cost*	0.5	0.5	0.5	0.7	0.7	0.7

* See Footnote for Basin 2

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Maine			
Gilman (Daniel Coit) Summer Home, Over-Edge, c. 1880	Northeast Harbor		BLDG	NHL
St. Croix Island National Monument, 1604	St. Croix Junction vicinity	56.5 A	SITE	NPS
Battery Gosselin	Maine	5 A		SHM
Fort Baldwin	Maine	45 A		SHM
Fort St. George	Maine	3 A		SHM
Narrow's Island	Maine	3 A		SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Acadia National Park	Maine	28,619A	bio,geo	NPS
Big Hill	Maine	1,000A	bio	POT
Camden Hills State Park	Maine	5,004A	bio	SP
Grand Lakes	Maine	2,000A	bio	POT
Monhegan Island	Maine			NL
Moosehorn National Wildlife Refuge	Maine	22,566A	bio	NFW
Moose Point State Park	Maine	178A	bio	SP
Reid State Park	Maine	792A	bio	SP
Ten Pound Island	Maine			AUD
Todd Wildlife Sanctuary	Maine			AUD
Tunk Lake	Maine	2,000A	bio	POT
Warren Island State Park	Maine	76A	bio	SP
Western Egg Rock	Maine			AUD
West Quoddy Head State Park	Maine	150A	bio	SP

Additional Sites identified by the Maine Department of Inland Fisheries and Game

SITE	LOCATION (COUNTY)	FEATURE
Frost Brook Falls	Hancock	Waterfall
Taunton River Falls	Hancock	Reversing tidal falls
Machias Falls	Washington	Waterfall
Hell Gate	Washington	Reversing tidal falls on the Dennys River
Machias River, Pleasant River, Narraguagus River, East Machias River, Dennys River, St. Croix River and Tunk Stream	Washington	Atlantic Salmon Rivers
Floods Pond	Washington	The only remaining pond in the nation with a pure strain of Sunapee Trout

BASIN 6

About half of the Presumscot Basin consists of Rolling Hills with the remainder divided between Steep Hills and Mountains. The pattern distribution is as follows: 37% in Forest-Town, 20% in Forest-Wildland, 40% in Farm-Forest and the remainder in City Units. The Farm-Forest is of high quality and is the only significant Farm-Forest landscape east of the Connecticut River.

Population density varies but averages 109 persons per square mile according to the 1960 census.

Sixteen miles of the Saco River is classified as a free-flowing stream in this basin.

The basin is of high visual quality. Contributing to this high ranking landscape is a significant amount of surface water, approximately five percent of the total surface area. Needs include the preservation of unique natural landscape and sixty miles of shoreline and the protection of quality landscapes.

An inventory of scientific areas for New Hampshire describing 41 significant sites was published in 1963. It is titled Natural Areas of New Hampshire Suitable for Ecological Research, by Charles Lyon and F. Herbert Bormann and is published by Dartmouth College Department of Biological Sciences.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Mountain	800 sq.mi.	City	100 sq.mi.
Steep Hill	1100 sq.mi.	Farm-Forest	1600 sq.mi.
Rolling Hill	2100 sq.mi.	Forest-Wildland	800 sq.mi.
		Forest-Town	1500 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 6

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Protect Landscape Quality (sq.mi.)	700	700	700	700	700	700
Unique Shoreline (linear mi.)	60					
LEGAL DEVICES						
Fee Simple (sq.mi.)	250	250	250			
Fee Simple (linear mi.)	60					
Easements (sq.mi.)	250	250	250	250	250	250
Zoning and/or Tax Incentive-Subsidy (sq.mi.)	200	200	200	450	450	450
OTHER DEVICES						
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	53.0	36.0	36.0	16.0	16.0	16.0
Annual Cost*	0.3	0.3	0.3	0.7	0.7	0.7

* See Footnote for Basin 2

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Maine			
Stowe (Harriet Beecher) House, 1804	Brunswick		BLDG	NHL
Harpswell Meetinghouse, 1757-59	Brunswick vicinity		BLDG	NHL
Pepperrell (Mary) House c. 1760	Kittery Point		BLDG	NHL
Wadsworth-Longfellow House 1786	Portland		BLDG	NHL
Homer (Winslow) Studio,1870	Scarborough		BLDG	NHL
Old York Gaol, C. 1720	York		BLDG	NHL
McIntyre Garrison House 1690 or 1707	York vicinity		BLDG	NHL
John Paul Jones		1 A		SHM
Mere Point		10 A		SHM
	New Hampshire			
Jackson (Richard) House 1664	Portsmouth		BLDG	NHL
MacPhedris-Warner House 1718-23	Portsmouth		BLDG	NHL
Moffatt-Ladd House,c.1764	Portsmouth		BLDG	NHL
Wentworth-Gardner House,1760	Portsmouth		BLDG	NHL
Wentworth-Coolidge Mansion, 1695, 1730, 1750	Portsmouth		BLDG	NHL
Fort Constitution		12 A		SHM
Phillips Exeter Academy				OTH

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Bradbury State Park	Maine	271 A	geo	SP
Two Lights State Park	Maine	40 A	bio	SP
Vaughn Woods State Park	Maine	250 A	bio	SP
Little Duck Island	Maine			AUD
White Mountains National Forest	N.H.	677,000 A	bio, geo wild	NFS

BASIN 7

More than half of this basin is composed of Rolling Hills; about one-third is Steep Hills and a lesser amount is Mountains. Most of the area is of a Forest-Town pattern. In addition to the City Units (12%), about 8% of the area is in Forest-Wildland and about 10% in Farm-Forest.

Population density averages 171 persons per square mile (1960 census).

About half of the basin is of first-ranking quality and half is of medial quality. The proximity of the Farm-Forest and Forest-Wildland Units to metropolitan areas should be noted. Lake Winnepesaukee and portions of the White Mountains National Forest are within a 2½ hour driving distance from the Boston metropolitan region. There is a clustering of historic sites in the Concord, Massachusetts vicinity. Needs include the preservation of unique natural landscapes, the protection and development of quality landscapes and the provision of metropolitan amenities and clean water.

An inventory of scientific areas for New Hampshire describing 41 significant sites was published in 1963. It is titled Natural Areas of New Hampshire Suitable for Ecological Research, by Charles Lyon and F. Herbert Bormann and is published by Dartmouth College Department of Biological Sciences.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Mountain	400 sq.mi.	City	600 sq.mi.
Steep Hills	1400 sq.mi.	Farm-Forest	500 sq.mi.
Rolling Hills	3200 sq.mi.	Forest-Town	3500 sq.mi.
		Forest-Wildland	400 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 7

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Protect Landscape Quality (sq.mi.)	300	300	300	300	300	300
Develop Landscape Quality (sq.mi.)	70	70	70	35	35	35
Develop Clean Water (% of basin)	75%			75%		
Develop Metropolitan Amenities (sq.mi.)	35			20	15	
LEGAL DEVICES						
Fee Simple (sq.mi.)	255	220	220			
Purchase-Lease Back (sq.mi.)				55	50	35
Easements (sq.mi.)	150	150	150	150	150	150
Zoning and/or Tax Incentive-Subsidy (sq.mi.)				150	150	150
OTHER DEVICES						
Impoundment	x	x	x	x	x	x
Water Supply	x	x	x	x	x	x
Waste Treatment	x			x		
Recreation Facility	x	x	x	x	x	x
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	58.0	52.0	52.0	28.5	27.5	23.5
Annual Cost*				0.3	0.3	0.3
Annual Return				0.3	0.3	0.2

* See Footnote for Basin 2

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Massachusetts			
Whittier (John Greenleaf) House, 1836	Amesbury		BLDG	NHL
Emerson (Ralph Waldo) Home 1835	Concord		BLDG	NHL
Minute Man National Historical Park, 1775	Concord	750 A	SITE	NPS
Old Manse, c. 1765	Concord		BLDG	NHL
Orchard House, mid-19th century	Concord		BLDG	NHL
Walden Pond	Concord	144 A	SITE	NHL
Wright's Tavern, 1747	Concord		BLDG	NHL
	New Hampshire			
Frost (Robert) Homestead 1900-09	Derry vicinity		SITE	NHL
Pierce (Franklin) Homestead, 1804	Hillsboro vicinity		BLDG	NHL
MacDowell Colony, 1907	Peterborough	400 A	SITE & BLDG	NHL
Covered Railroad Bridge				OTH
Daniel Webster Birthplace		150 A		SHM
Hannah Dustin Monument		67 A		SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Great Meadows National Wildlife Refuge	Mass.	216 A	bio	NFW
Curtiss Dogwood State Scientific Area	N.H.	14 A	bio	SNA
De Pierrefue Sanctuary	N.H.	7 A	bio	AUD
Franconia Notch State Park	N.H.	6635 A	geo	SP
Lost River Reservation	N.H.	50 A	bio, geo	OTH
Rhododendron State Park	N.H.	294 A	bio	SP
Rollins State Park	N.H.	118 A	geo	SP
Sculptured Rocks Wayside Area State Scientific Monument	N.H.	20 A	geo	SNA
Winslow Site State Park	N.H.	2918 A	geo	SP

BASIN 8

Over 60% of this basin consists of Steep Hills, about 28% is Rolling Hills and Mountains comprise the remainder. One-fifth of all the Steep Hill landscape in the NAR is found here. Pattern distribution in this basin with the most diverse landscape in New England, is as follows: Town-Farm - 10%; Forest-Town - 41%; Farm-Forest - 15%; Forest-Wildland - 28% and City Units - 6%.

Population density varies but averages 144 persons per square mile (1960).

The basin is almost evenly divided between high and medial quality landscapes. Needs include the preservation of unique natural landscapes, protection of quality landscapes and the provision of clean water for the central and lower (Hartford-Springfield area) reaches of the basin.

Free-flowing streams include 12 miles of the Perry, 24 miles of the Indian and 12 of the Nash, all of which are in New Hampshire, and 65 miles of the Deerfield River in Massachusetts. The mid-basin agriculture provides open space on the valley floor which contrasts to the wooded valley sides and to the rapidly northward moving urbanization. Further north in the upper reaches are some of the remaining vestages of the hillside farm which were typical of the New England farm landscape but which are now rapidly disappearing. The combination of small town, village green, open agricultural bottomlands and hillside farms surrounded with wooded mountainside and crossed with streams provides a unique and exceptional landscape not found elsewhere within the NAR.

The January 1970 publication of the Connecticut River Basin Coordinating Committee entitled Comprehensive Water and Related Land Resources Investigation provides the results of the study thus far and indicates that extensive information will be forthcoming. A preliminary publication of the archaeological inventory has been released and contains an extensive inventory of some 600 sites together with recommendations for further action where needed. Certain areas known to be rich in archaeological manifestations are pin-pointed. An historical inventory covering 100 sites and a

Natural Resources report of 155 sites will be forthcoming. A list of rivers which deserve priority consideration in river management plans intended to preserve cultural, scenic and wilderness qualities and to determine recreational potential is also included.

A second valuable source is New England Heritage, a 1968 publication of the Bureau of Outdoor Recreation on a National Recreation Area in the basin. The report contains more detailed information which could be of assistance in planning. The two inventories by Dr. Hubert W. Vogelmann on natural areas of Vermont provide additional information for the Vermont portion of this basin. They list 65 ecological sites of public importance. They are:

1. Natural Areas of Vermont, Report 1, 1964, published by the Agricultural Experiment Station at the University of Vermont

2. Vermont Natural Areas, Report 2, 1969, published by the Vermont State Central Planning Office.

An inventory of scientific areas for New Hampshire describing 41 significant sites was published in 1963. It is titled Natural Areas of New Hampshire Suitable for Ecological Research, by Charles Lyon and F. Herbert Bormann and is published by Dartmouth College Department of Biological Sciences.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Mountain	1100 sq.mi.	City	700 sq.mi.
Steep Hills	6800 sq.mi.	Town-Farm	1100 sq.mi.
Rolling Hills	3200 sq.mi.	Farm-Forest	1700 sq.mi.
		Forest-Town	4500 sq.mi.
		Forest-Wildland	3100 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 8

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Preserve Unique Landscape (sq.mi.)	3000			3000		
Protect Landscape Quality (sq.mi.)	700	700	700	700	700	700
Develop Clean Water (% of basin)	40%			40%		
LEGAL DEVICES						
Fee Simple (sq.mi.)	3350	350	350	1500		
Easements (sq.mi.)	350	350	350	350	350	350
Zoning and/or Tax Incentive-Subsidy (sq.mi.)				1850	350	350
OTHER DEVICES						
Waste Treatment	x			x		
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	405.0	99.0	99.0	197.0	44.0	44.0
Annual Cost*				4.0	1.0	1.0

* See Footnote for Basin 2

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Connecticut			
Stanley-Whitman House, 1660	Farmington		BLDG	NHL
Barnard (Henry) House, 1807	Hartford		BLDG	NHL
Colt (Samuel) Home Armswear, 1855	Hartford		BLDG	NHL
Old Statehouse, 1796	Hartford		BLDG	NHL
Twain (Mark) Home, 1874	Hartford		BLDG	NHL
Webster (Noah) Birthplace c. 1676	Hartford		BLDG	NHL
Buttolph-Williams House, 1692	Wethersfield		BLDG	NHL
Webb (Joseph) House, 1752	Wethersfield		BLDG	NHL
Chatfield Hollow State Park		345 A		SP
Gay City State Park		1576 A		SP
Gillette Castle State Park		144 A		SP
	Massachusetts			
Dickinson (Emily) House 1813	Amherst		BLDG	NHL
Bryant (William Cullen) Homestead, c. 1799	Cummington vicinity		BLDG	NHL
Old Deerfield Village Historic District, c.1670	Deerfield		DIST	NHL
Springfield Armory, 1794	Springfield		BLPX	NHL
Capen (Joseph) House, Parson Capen House, 1683	Topsfield		BLDG	NHL
	New Hampshire			
Saint-Gaudens National Historic Site, c. 1800	Plainfield	36 A	BLPX	NPS
Dartmouth College				OTH

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Vermont			
Coolidge (Calvin) Homestead, 1878-87	Plymouth Notch		BLDG	NHL
Morrill (Justin) Homestead, c. 1848	Strafford		BLDG	NHL
Robbins & Lawrence Armory & Machine Shop, 1846	Windsor		BLDG	NHL
Marsh (George Perkins) Boyhood Home, 1805-07,1885	Woodstock		BLDG	NHL
Daniel Webster Memorial				SHM
Scott Covered Bridge				SHM
Vermont Farmer's Museum				SHM
Wilder House				SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Burnham Brook	Conn.	45 A	bio	OTH
Campbell Falls State Park	Conn.	102 A	geo	SNA
Cotton Hollow	Conn.	5 A	bio	OTH
Dennis Hill State Park	Conn.	240 A	geo	SNA
George D. Seymour State Park	Conn.	200 A	wild	SNA
Hurd State Park	Conn.	698 A	geo	SNA
Lamentation Mountain State Park	Conn.	48 A	geo	SNA
McLean Preserve	Conn.	4000 A	bio	OTH
Joseph A. Skinner State Park	Mass.	375 A	geo	SP
Westfield River Upper Wilderness Area	Mass	1300 A	bio, wild	POT

NATURAL AREAS (con't.)

SITE	LOCATION	AREA	FEATURE	CLASS
Beaver Brook State Scientific Monument	N.H.	4 A	geo	SNA
Cardigan State Park	N.H.	5525 A	geo	SP
Chesterfield Gorge Wayside Area Scientific Monument	N.H.	15 A	bio	SNA
Dixville Notch Wayside Area	N.H.	137 A	geo	SP
Monadnock State Park	N.H.	699 A	geo	SP
Moose Pasture Bog	N.H.	75 A	bio	POT
Norton Pool	N.H.	125 A	bio	POT
Pillsbury State Park	N.H.	4002 A	geo	SP
Plummer's Ledge State Scientific Area	N.H.	3 A	geo	SNA
Polar Caves	N.H.	30 A	bio	OTH
Ascutney State Park	Vt.	1530 A	geo	SP

BASIN 9

Rolling Hills (75%) and Undulating Land (25%) constitute the land form of this basin. It is a heavily urbanized basin with 49% of the area in City Units. The only other Unit pattern to be noted is Forest-Town which covers 51% of the basin. The overall quality of the landscape is ranked as medial.

The highest population density in New England, 1077 persons per square mile (1960 census) is found in this commercial, industrial, financial and educational core.

This highly urbanized area also contains several free flowing streams; 40 miles of the Pawcatuck River and 25 miles of the Usquepaug and Beaver Rivers, all in Rhode Island. Clustering of historic sites are found scattered throughout the basin and include: Boston - 24, Cambridge - 5, Newport - 10, and Providence and Salem - both 5. Needs include the protection of quality landscape, preservation of unique landscapes and increasing urban amenities including recognition of river and waterfront amenity values, and the provision of clean water.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Rolling Hills	3100 sq.mi.	City	2000 sq.mi.
Undulating Land	1000 sq.mi.	Forest-Town	2100 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 9

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Preserve Unique Landscape (sq.mi.)	800			800		
Preserve Coastline (linear mi.)	20			10		
Develop Landscape Quality (sq.mi.)	200	200	200	100	100	100
Develop Clean Water (% of basin)	100%			100%		
Develop Metropolitan Amenities (sq.mi.)	50				50	
LEGAL DEVICES						
Fee Simple (sq.mi.)	450	200	200	100		
Fee Simple (Linear mi.)	20			10		
Purchase-Lease Back (sq.mi.)				100	150	100
Zoning (sq.mi.)	600			700		
OTHER DEVICES						
Impoundment	x	x	x	x	x	x
Water Supply	x	x	x	x	x	x
Waste Treatment	x			x		
Recreation Facility	x	x	x	x	x	x
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Corrective Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	438.5	70.0	70.0	207.5	52.5	35.0
Annual Return				.7	4.2	.7

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Connecticut			
Fort Griswold		16 A		SHM
Fort Shantock State Park		183 A		SHM
John Mason				SHM
Israel Putnam				SHM
Miantomono				SHM
Nathaniel Lyon				SHM
Wolf Den State Park		697 A		SHM
	Massachusetts			
Goddard Rocket Launching Site, 1926	Auburn vicinity		SITE	NHL
Arnold Arboretum, c. 1873	Boston		SITE	NHL
Beacon Hill Historic District, 18 & 19 century	Boston		DIST	NHL
Boston Anthenaeum, 1847	Boston		BLDG	NHL
Boston Light, 1716, 1783	Boston Harbor		STRT	NHL
Boston Naval Shipyard, c.1800	Boston		BLPX	NHL
Bunker Hill Monument, 1825	Boston	4 A	STRT	NHL
U.S.S. Constitution, 1797	Boston		STRT	NHL
Dorchester Heights National Historic Site, 1776	Boston	5 A	SITE	NPS
Ether Dome, Massachusetts General Hospital, 1818	Boston		STRT	NHL
Faneuil Hall, 1761	Boston		BLDG	NHL
Harding (Chester) House, 1808	Boston		BLDG	NHL
Headquarters House, 1806	Boston		BLDG	NHL
King's Chapel, 1749-54	Boston		BLDG	NHL
Long Wharf and Customhouse Block, 1710-21; 1848	Boston		BLPX	NHL

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Massachusetts Historical Society, 1899	Boston		BLDG	NHL
Massachusetts Statehouse,1789	Boston		BLDG	NHL
Old North Church, Christ Church, 1723	Boston		BLDG	NHL
Old South Meetinghouse 1729-30	Boston		BLDG	NHL
Old Statehouse, 1712-13;1740	Boston		BLDG	NHL
Parkman (Francis) House,1824	Boston		BLDG	NHL
Pierce (Moses)-Hichborn House, 1680-1710	Boston		BLDG	NHL
Quincy Market, 1825-26	Boston		BLPX	NHL
Revere (Paul) House,c.1676	Boston		BLDG	NHL
Tremont Street Subway, 1895-98	Boston		STRT	NHL
J.F.Kennedy National Historic Site, c. 1908	Brookline	.09 A	BLDG	NPS
Olmsted (Frederick Law) House, 1810	Brookline		BLDG	NHL
Gray (Asa) House, 1810	Cambridge		BLDG	NHL
Christ Church, 1759-61	Cambridge		BLDG	NHL
Lowell (James R.) Home, Elmwood, 1766	Cambridge		BLDG	NHL
Massachusetts Hall, Harvard University, 1718-20	Cambridge		BLDG	NHL
Vassall (John) House, Craigie-Longfellow House,1759	Cambridge		BLDG	NHL
Derby Summerhouse,1792-3	Danvers		BLDG	NHL

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Fairbanks House, c.1636	Dedham		BLDG	NHL
Old Ship Meeting-House, 1681	Hingham		BLDG	NHL
Whipple (John) House, c.1640	Ipswich		BLDG	NHL
Buckman Tavern, c. 1690	Lexington		BLDG	NHL
Lexington Green, 1775	Lexington		SITE	NHL
Lee (Jeremiah) House, 1768	Marblehead		BLDG	NHL
Royal (Isaac) House mid-17 century	Medford		BLDG	NHL
Tufts (Peter) House, 1675	Medford		BLDG	NHL
Forbes (Captain R.B.) House, 1833	Milton		BLDG	NHL
Coffin (Jethro) House, c.1686	Nantucket		BLDG	NHL
Nantucket Historic District c. 1700-1874	Nantucket		DIST	NHL
New Bedford Historic District, 18 & 19 century	New Bedford		DIST	NHL
Spencer-Pierce-Little House 17 or 18 century	Newbury		BLDG	NHL
Cole's Hill, 1620	Plymouth		SITE	NHL
Adams (John) Birthplace 1681	Quincy		BLDG	NHL
Adams (John Q.) Birthplace 1663	Quincy		BLDG	NHL
Adams National Historic Site, 1731	Quincy	5 A	BLDG	NPS
Garrison (William Lloyd) House, 1864	Roxbury		BLDG	NHL
Shirley-Eustice House, 1747	Roxbury		BLDG	NHL

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Bowditch (Nathaniel) House early 19th century	Salem		BLDG	NHL
Peabody Museum of Salem, 1825	Salem		BLDG	NHL
Peirce-Nichols House, 1782	Salem		BLDG	NHL
Salem Maritime National Historic Site, 17,18, 19 century	Salem	11 A	SITE BLPX	NPS
Ward (John) House, 1684	Salem		BLDG	NHL
Saugus Iron Works National Historic Site, c.1648	Saugus	9 A	BLPX	NPS
Scotch-Boardman House, c. 1680	Saugus		BLDG	NHL
Brook Farm, 1841	West Roxbury		SITE	NHL
American Antiquarian Society 1910-30	Worcester		BLDG	NHL
Dighton Rock State Park		85 A		SHM
First Normal School				OTH
Plymouth Rock				SHM
Standish Monument				SHM
	Rhode Island			
Arnold (Eleazer) House 1687	Lincoln		BLDG	NHL
Brick Market, 1762-72	Newport		BLDG	NHL
Hunter House, c. 1748	Newport		BLDG	NHL
Newport Historic District 18 century	Newport		DIST	NHL
Old State House, 1739-41	Newport		BLDG	NHL
Redwood Library, 1750	Newport		BLDG	NHL
Touro Synagogue National Historic Site, 1763	Newport	.25 A	BLDG	NPS

HISTORIC AREAS (con't.)

SITE AND AREA	LOCATION	AREA	TYPE	CLASS
Trinity Church, 1725-6	Newport		BLDG	NHL
U.S. Naval War College, 1819	Newport		BLDG	NHL
Vernon House, late 1750's	Newport		BLDG	NHL
Wanton-Lyman-Hazard House 1695	Newport		BLDG	NHL
Old Slater Mill, 1793	Pawtucket		BLDG	NHL
Brown (John) House,1786-8	Providence		BLDG	NHL
First Baptist Meetinghouse 1774-5	Providence		BLDG	NHL
Roger William National Memorial, 1636	Providence	5 A	SITE (proposed)	NPS
University Hall, Brown University, 1770-71	Providence		BLDG	NHL
Stuart (Gilbert) Birthplace 1755	Providence		BLDG	NHL
Bell Schoolhouse State Historic Site		1 A		SHM
Ft. Adams				SHM
Ft. Greene State Park		91 A		SP
Great Swamp Fight				SHM
General Stanton State Historic Site				SHM
Jireh Bull Garrison State Historic Site				SHM
Queen's Fort State Historic Site		64 A		SHM
World War II Memorial State Historic Site				SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Black Pond	Mass.		bio	OTH
Cape Cod National Seashore	Mass	16,645 A	bio	NPS
Elizabeth Islands	Mass.	10,000 A	bio	POT
Gay Head Cliffs	Mass. (Martha's Vinyard)			NL
Monomoy National Wildlife Refuge	Mass.	216 A	bio	NFW
Parker River National Wildlife Refuge	Mass.	6403 A	bio	NFW
Purgatory Chasm State Reservation	Mass.	424 A	bio	SP
Bowdish Reservoir	R.I.	450 A	geo	POT
Cedar Swamp	R.I.	200 A	geo	POT
Ft. Greene State Park	R.I.	91 A	geo	SP
Hundred Acre Cove	R.I.	150 A	bio	POT
Pine Barrens	R.I.	1000 A	geo	POT
Pocassett Brook	R.I.	500 A	geo	POT
Diamond Hill State Park	R.I.	373 A	geo	SP

BASIN 10

Approximately four-fifths of the basin is composed of Rolling Hills and one-fifth is of Steep Hills. In this relatively urban basin with one-fourth of the area in City Units, there is a predominant pattern of Forest-Town landscape (68%) and a small amount (7%) of Town-Forest Units. Overall landscape quality for this basin is medial.

Population density averages 506 persons per square mile (1960).

The Rolling Hill, Forest-Town landscape of high quality found on the New York-Connecticut line is within a short driving time of major metropolitan areas and this warrants protection from the expanding urban pressures. The coastline in the basin is already extensively developed but access for public recreation purposes is needed. There is a clustering (5) of historic sites in the New Haven vicinity. Needs include the preservation of shoreline, development of quality landscapes, protection of landscape diversity, provision of clean water for the entire area (100%) and the provision of urban amenities.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Steep Hills	800 sq.mi.	City	1100 sq.mi.
Rolling Hills	3500 sq.mi.	Town-Farm	300 sq.mi.
		Forest-Town	2900 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 10

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Preserve Coastline (linear mi.)	60			70		
Protect Coastline (linear mi.)	20			10		
Protect Landscape Diversity (sq.mi.)	30	30	30	15	15	15
Develop Landscape Quality (sq.mi.)	300	300	300	150	150	150
Develop Clean Water (% of basin)	100%			100%		
Develop Metropolitan Amenities (sq.mi.)	55			30	25	
LEGAL DEVICES						
Fee Simple (sq.mi.)	370	315	315			
Fee Simple (linear mi.)	20			10		
Purchase-Lease Back (sq.mi.)				180	175	150
Easements (sq.mi.)	15	15	15	15	15	15
Zoning (linear mi.)	60			70		
OTHER DEVICES						
Impoundment	x	x	x	x	x	x
Water Supply	x	x	x	x	x	x
Waste Treatment	x			x		
Recreation Facility	x	x	x	x	x	x
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Corrective Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	395.0	98.5	98.5	198.0	56.5	49.0
Annual Return				1.0	1.0	1.0

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Connecticut			
Mather (Stephen T) House 1778	Darien		BLDG	NHL
Trumbull (John) Birthplace c. 1735	Lebanon		BLDG	NHL
Litchfield Historic District late 18 century	Litchfield	several blocks	DIST	NHL
Reeve (Tapping) House and Law School,1772;1784	Litchfield		BLDG	NHL
Charles W. Morgan (Whaling vessel) 1841	Mystic Seaport		STRT	NHL
Rogers (John) Studio, 1877	New Canaan		BLDG	NHL
Connecticut Agricultural Experiment Station,1882-3	New Haven		BLPX	NHL
Connecticut Hall, Yale University, 1750-2	New Haven		BLDG	NHL
Dana (James Dwight) House 1849	New Haven		BLDG	NHL
First Telephone Exchange 1878	New Haven		BLDG	NHL
Marsh (Othniel C.) House 1878	New Haven		BLDG	NHL
Remington (Frederic) House 1909	Ridgefield		BLDG	NHL
Saybrook Fort		17 A		SHM
Swampfight				SHM
	Massachusetts			
Melville (Herman) House, Arrowhead, 1794	Pittsfield		BLDG	NHL

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Hancock Shaker Village, 1790-1960	Pittsfield vicinity		BLPX	NHL
Mission House, 1739	Stockbridge		BLDG	NHL
French (Daniel C.) Home & Studio, Chesterwood, 1900-01	Stockbridge vicinity		BLPX	NHL

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Akeley Tract	Conn.	12 A	bio	OTH
Beaver Brook State Park	Conn.	401 A	bio	SNA
Frederic C. Walcott Preserve	Conn.	278 A	bio	OTH
Greenwich Audubon Center	Conn.	430 A	bio	AUD
Guilford Salt Meadow Sanctuary	Conn.	150 A	bio	AUD
Housatonic Meadows State Park	Conn.	448 A	geo	SNA
Kent Falls State Park	Conn.	275 A	geo	SNA
Mamacoke Island	Conn.	40 A	bio, geo	OTH
Miles Wildlife Sanctuary	Conn.		bio	AUD
Sharon Audubon Center	Conn.	526 A	bio	AUD
Sleeping Giant State Park	Conn.	1253 A	geo	SNA
Taconic Tri-State Park (Conn. portion)	Conn.	15000 A	bio, wild	POT
Taine Mountain Preserve	Conn.	13 A	bio	OTH
West Peak State Park	Conn.	181 A	geo	SNA
White Memorial Sanctuary	Conn.	4424 A	bio	OTH
Pawling Preserve	N.Y.	1000 A	bio	OTH

BASIN 11

The distribution of land form in this basin is as follows: Mountains-13%, Steep Hills-29%, Rolling Hills 37% and Undulating Land-21%. The diversity found in land form is duplicated in diversity of pattern. The distribution is as follows: City Units-1%, Town-Farm-22%, Farm-20%, Farm-Forest-15%, Forest-Town-8% and Forest-Wildland-34%. Overall quality ranks 33% of the basin as of high quality, 40% of medial quality and 27% of low quality landscape.

Population density in the eastern portion of the basin was 35 persons per square mile and 46 persons per square mile in the western portion (1960 census).

The landscapes represented by the Adirondack Mountain Forest Preserve and the Green Mountains in Vermont, and by the agricultural valleys of the Saint Lawrence and Champlain basins provide a rich and diverse landscape of relative low population density which is not in the immediate path of major metropolitan area population pressures. A forty mile portion of the Ausable River is classified as a free-flowing stream. The major needs are to preserve the unique landscapes and to protect quality landscapes, the agricultural valley and the composite landscape.

Two inventories by Dr. Hubert W. Vogelmann list 65 sites of ecological importance in Vermont and provide additional information for that portion of the basin in Vermont. The publications are:

1. Natural Areas of Vermont, Report 1, 1964, published by the Agricultural Experiment Station at the University of Vermont.

2. Vermont Natural Areas, Report 2, 1969, published by the Vermont State Central Planning Office

NEEDS, DEVICES AND COSTS - BASIN 11

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Preserve Unique Landscape (sq.mi.)	2100			2100		
Protect Landscape Quality (sq.mi.)	250	250	250	250	250	250
Protect Landscape Diversity (sq.mi.)	50	50	50	50	50	50
Protect Agricultural Valleys (sq.mi.)	1600			1600		
LEGAL DEVICES						
Fee Simple (sq.mi.)	1850	150	150	850		
Zoning (sq.mi.)	2000			1550	300	300
Zoning and/or Tax Incentive-Subsidy (sq.mi.)				1600		
Easements (sq.mi.)	150	150	150			
OTHER DEVICES						
Water Supply	x			x		
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	130.0	18.0	18.0	55.0		
Annual Cost*				2.0		

*See Footnote for Basin 2

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Mountains	1500 sq.mi.	City	100 sq.mi.
Steep Hills	3500 sq.mi.	Town-Farm	2600 sq.mi.
Rolling Hills	4400 sq.mi.	Farm	2400 sq.mi.
Undulating Land	2500 sq.mi.	Farm-Forest	1800 sq.mi.
		Forest-Town	1000 sq.mi.
		Forest-Wildland	4000 sq.mi.

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	New York			
Fort Crown Point, 1760	Crown Point vicinity		SITE	NHL
Fort St. Frederic,1731	Crown Point vicinity		SITE	NHL
Adirondack Forest Preserve 1885 (also Basin 12)	Northeast NY state	2,115,381A	DIST	NHL
Plattsburgh Bay, 1814	Plattsburgh vicinity		SITE	NHL
Valcour Bay 1776	Plattsburgh vicinity		SITE	NHL
Watson (Elkanah) House 1828	Port Kent		BLDG	NHL
Fort Ticonderoga,1755-7	Ticonderoga vicinity		BLPX	NHL
John Brown Farm		160 A		SHM
	Vermont			
Willard (Emma) House 1809	Middlebury		BLDG	NHL
Frost (Robert)Farm, Homer Noble Farm, 1940-63	Ripton vicinity		BLDG	NHL
The Ticonderoga, 1906	Shelburne		STRT	NHL
Hubbardton Battlefield		50 A		SHM
Hyde Log Cabin				SHM

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Middlebury College				OTH
Mount Independence		121 A		SHM
President Chester A Arthur Birthplace				SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Adirondack Forest Preserve	N.Y.	2,284,583A	geo, bio wild	SP
Ainsworth State Park	Vermont	432A	geo	SP
Button Bay State Park	Vermont	215A	geo	SP
Camels Hump	Vermont		bio	NL
Green Mountains National Forest	Vermont	231,825A	bio,geo	NFS
Hazen's Notch State Park	Vermont	140A	geo	SP
Lake Willoughby Natural Area	Vermont			NL
Mississquoi National Wildlife Refuge	Vermont	3,700A	bio	NFW
Monroe State Park	Vermont	222A	geo	SP

BASIN 12

Land form distribution for the Hudson basin is as follows: Mountains 5%, Steep Hills 32 %, Rolling Hills 39% and Undulating Land 24%. Pattern distribution is equally diverse with Town-Farm 26%, Farm 26%, Forest-Town 5%, Forest-Wildland 35% and City Units comprising the remainder (8%). Over half of the basin is of medial landscape quality; one-fourth is high, and the remainder is low.

Population density varies from 3 persons per square mile in Hamilton County to 776 in Rockland County. It averages 12 in the very western end of the basin, 107 in the northern section and 161 in the southern half.

The Adirondack Mountain Forest Preserve and the Catskill Mountain Preserve, together with the Mohawk Valley and Great Valley agricultural lands provide a diverse landscape with low population density which is of medial distance from population pressures. Needs include preserving unique natural landscapes, protecting quality landscapes, composite landscapes and agricultural valleys and the providing of clean water and urban amenities.

Two natural area inventories by Dr. Hubert W. Vogelmann provide additional information for that portion of the basin in Vermont. The publications are:

1. Natural Areas of Vermont, Report 1, 1964, published by the Agricultural Experiment Station at the University of Vermont

2. Vermont Natural Areas, Report 2, 1969, published by the Vermont State Central Planning Office.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Mountains	700 sq.mi.	City	1000 sq.mi.
Steep Hills	4200 sq.mi.	Town-Farm	3400 sq.mi.
Rolling Hills	5200 sq.mi.	Farm	3400 sq.mi.
Undulating Lands	3100 sq.mi.	Forest-Town	700 sq.mi.
		Forest-Wildland	4700 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 12

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Protect Landscape Diversity (sq.mi.)	800	800	800	550	100	100
Protect Agricultural Valleys (sq.mi.)	2600			2600		
Develop Clean Water (% of basin)	30%			30%		
Develop Metropolitan Amenities (sq.mi.)	50				50	
LEGAL DEVICES						
Fee Simple (sq.mi.)	450	400	400	50	50	50
Purchase-Lease Back (sq.mi.)	2600			50		
Easements (sq.mi.)	400	400	400	50	50	50
Deed Restrictions (sq.mi.)	100				50	
Zoning and/or Tax Incentive-Subsidy (sq.mi.)	300			3000		
OTHER DEVICES						
Impoundment	x			x		
Water Supply	x			x		
Waste Treatment	x			x		
Recreation Facility	x			x		
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Corrective Flood Plain Management	x			x		
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	469.0	140.0	140.0	43.0	25.5	25.5
Annual Cost*	1.0			15.0		
Annual Return	6.0			.4		

* See Footnote for Basin 2

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	New York			
Schuyler (Philip) Mansion, 1761-2	Albany		BLDG	NHL
Saratoga National Historic Park, 1777	Albany vicinity	5500 A	SITE	NPS
Erie Canal, 1825	Amsterdam vicinity		STRT	NHL
Cole (Thomas) House, 1812-14	Catskill		BLDG	NHL
Church (Frederic E.) House, Olana, 1874	Church Hill		BLDG	NHL
Bronck (Pieter) House 1663; 1682; 1738	Coxsackie		BLDG	NHL
Van Cortland Manor, c.1650	Croton-on-Hudson		BLDG	NHL
Historic Track, 1854	Goshen		STRT	NHL
Harriman (E.H.)Estate, Arden, 1909	Harriman		BLDG	NHL
Home of Franklin D. Roosevelt National Historic Site, 1826	Hyde Park	188 A	SITE BLDG	NPS
Vanderbilt Mansion National Historic Site, 1896-8	Hyde Park	212 A	BLPX	NPS
Palisades Interstate Park 1899	Hudson River		DIST	NHL
Johnson Hall, 1762	Johnstown		BLDG	NHL
Van Alen (Luycas) House 1737-1750	Kinderhook vicinity		BLDG	NHL
Van Buren (Martin) House Lindenwald, 1797	Kinderhook vicinity		BLDG	NHL
Hough House, c. 1861	Lowville		BLDG	NHL
Washington's Headquarters 1750	Newburgh		BLDG	NHL

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Mount Lebanon Shaker Society, 1787	New Lebanon		BLPX	NHL
Hasbrouk (Jëan) House, 1694	New Paltz		BLDG	NHL
Hugeunot Street Historic District, 17 & 18 century	New Paltz		BLPX	NHL
Adirondack Forest Preserve 1885 (also Basin 11)	northeast NY State	2,115,381 A	DIST	NHL
Delaware & Hudson Canal,1828	Orange County		STRT	NHL
Dutch Reformed Church (Sleepy Hollow) c. 1700	North Tarrytown		BLDG	NHL
Hurley Historic District 17 & 18 century	Hurley		DIST	NHL
Morse (Samuel F.B.) House, Locust Grove, 1830	Poughkeepsie		BLDG	NHL
Fort Crailo, c. 1700	Rensselaer		BLDG	NHL
Burroughs (John) Home, Woodchuck Lodge, 1908	Roxbury		BLDG	NHL
Stony Point Battlefield,1779	Stony Point vicinity		SITE	NHL
Gould (Jay) Estate, Lyndhurst, 1838	Tarrytown		BLDG	NHL
Irving (Washington) House Sunnyside, c. 1656	Tarrytown vicinity		BLDG	NHL
Philipsburg Manor, c. 1683	Upper Mills		BLDG	NHL
Bennington Battlefield,1777	Walloomsac vicinity		SITE	NHL
Burroughs (John) Riverby Study, 1881	West Park		BLDG	NHL
Burroughs (John) Cabin, Slabsides, 1895	West Park vicinity		BLDG	NHL
U.S. Military Academy, 1778	West Point		DIST	NHL
Clinton House		1 A		SHM

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Grant Cottage Historic Site		1 A		SHM
Guy Park Manor		1 A		SHM
Herkimer Home		143 A		SHM
John Jay House		30 A		SHM
Knox Headquarters		50 A		SHM
Lake George Battleground State Park		35 A		SHM
Senate House		1 A		SHM
Temple Hill				SHM
	Vermont			
Frost (Robert) Farm, The Gully, 1790	South Shaftsbury		BLDG	NHL
Bennington Battle Monument				SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Balance Rock State Park	Mass.	140 A	geo	SP
Lindon Bates Memorial State Park	Mass.	424 A	bio	SP
Arthur W. Butler Memorial Sanctuary	N.Y.	230 A	bio	OTH
Dome Island Memorial Sanctuary	N.Y.	16 A	bio	OTH
Ellenville Fault Ice Caves	N.Y.			NL
High Tor State Park	N.Y.	491 A	bio	SP
John Boyd Thacher State Park	N.Y.	1108 A	geo	SP
Little Bear Swamp	N.Y.	25 A	bio	OTH
Mianus River Gorge Wildlife Refuge & Botanical Preserve	N.Y.	148 A	bio,geo	NL
Petrified Gardens	N.Y.			NL
Storm King State Park	N.Y.	1092 A	bio,geo	SP
Thompson Pond	N.Y.	100 A	bio	OTH

BASIN 13

The land form in this very urbanized basin is undulating. 21% of the basin consists of a Town-Farm Unit pattern, the remainder is in City Units.

The average population density is 5357 persons per square mile. It ranges from 24,783 in New York City to 723 in Suffolk County. Almost one-fourth of the total population in the NAR lives in this basin.

The quality landscape in the basin is limited to Westchester County and portions of the coastline. A clustering of historic sites occurs in New York (21) and in Brooklyn (4). Needs include the preservation, protection and/or development of 80 miles of shoreline, the protection of landscape diversity and the development of clean water and urban amenities for the residents of the area.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Undulating Land	1400 sq. mi.	City	1100 sq.mi.
		Farm-Forest	300 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 13

	Environmental Quality 1980	Environmental Quality 2000	Environmental Quality 2020	National Efficiency 1980	National Efficiency 2000	National Efficiency 2020
NEEDS						
Preserve Coastline (linear mi.)	80			40		
Protect Landscape Diversity (sq.mi.)	100			100		
Develop Clean Water (% of basin)	100%			100%		
Develop Metropolitan Amenities (sq.mi.)	60			30	30	
LEGAL DEVICES						
Fee Simple (sq.mi.)	110					
Fee Simple (linear mi.)	80			40		
Purchase-Lease Back (sq.mi.)				30	30	
Easements (sq.mi.)	50			25		
Zoning and/or Tax Incentive-Subsidy (sq.mi.)				75		
OTHER DEVICES						
Impoundment	x			x	x	
Water Supply	x			x	x	
Waste Treatment	x			x		
Recreation Facility	x			x	x	
Wildlife Facility	x			x	x	
Preventive Flood Plain Management	x			x	x	
Corrective Flood Plain Management	x			x	x	
Watershed Mgmt., Agricultural Practices	x			x		
Watershed Mgmt., Reforestation	x			x		
COST IN $ MILLION						
First Cost	533.0			260.0	9.0	
Annual Cost*				0.3		
Annual Return				0.6	0.2	

* See Footnote for Basin 2

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	New York			
New York Botanical Gardens 1896	Bronx	250 A	DIST	NHL
Van Cortland (Frederick) House, 1748-9	Bronx		BLDG	NHL
Brooklyn Bridge, 1882	Brooklyn		STRT	NHL
Brooklyn Heights Historic District, 19 century	Brooklyn		DIST	NHL
Plymouth Church of the Pilgrims, 1849	Brooklyn		BLDG	NHL
Wyckoff (Pieter) House 1639	Brooklyn		BLDG	NHL
The Old House, 1649	Cutchogue		BLDG	NHL
Moran (Thomas) House, 1884	East Hampton		BLDG	NHL
St. Paul's Church National Historic Site, 1790	Mt. Vernon	6 A	BLDG	NPS
Old Quaker Meeting House 1695	Flushing		BLDG	NHL
Arthur (Chester A) House 1885-6	New York		BLDG	NHL
Carnegie Hall, 1891	New York		BLDG	NHL
Carnegie (Andrew) Mansion 1901	New York		BLDG	NHL
Castle Clinton National Monument, 1811	New York	1 A	BLDG	NPS
Central Park, 1859-76	New York		DIST	NHL
City Hall, 1803-11	New York		BLDG	NHL
Cooper Union, 1850	New York		BLDG	NHL
Pupin Physics Laboratories Columbia University 1939	New York		BLDG	NHL

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Dyckman (William) House 1783	New York		BLDG	NHL
Federal Hall National Memorial 1699-1703	New York	.5 A	SITE	NPS
General Grant National Memorial 1897	New York	1 A	SITE	NPS
Hamilton Grange National Memorial 1801	New York	1 A	BLDG	NPS
Morgan (Pierpont) Library 1906	New York		BLDG	NHL
Morris-Jumel Mansion, 1765	New York		BLDG	NHL
New York Public Library 1911	New York		BLDG	NHL
The Players 1888	New York		BLDG	NHL
Theodore Roosevelt Birth-place National Historic Site, mid- 19 century	New York		BLDG	NPS
St. Paul's Chapel 1764-6	New York		BLDG	NHL
Statue of Liberty National Monument 1886	New York	58 A	STRT	NPS
Tredwell (Seabury) House Old Merchant's House 1832	New York		BLDG	NHL
Woolworth Building 1913	New York		BLDG	NHL
Delaware and Hudson Canal 1828	Orange County		STRT	NHL
Sagamore Hill National Historic Site 1884-5	Oyster Bay	85 A	BLDG	NPS
Sousa (John Phillip) House, Wildbank c.1907	Port Washington		BLDG	NHL
Riis (Jacob) House 1888	Richmond Hill		BLDG	NHL
The Voorlezer's House 1690	Staten Island		BLDG	NHL
Conference House 1680	Staten Island		BLDG	NHL

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Philipse Manor, c. 1700	Yonkers		BLDG	NHL
Metropolitan Opera				SHM
Walt Whitman House		1 A		SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Delafield Woods	N.Y.	15 A	bio	OTH
Elizabeth Morton National Wildlife Refuge	N.Y.	187 A	bio	NFW
Gardiner's Island	N.Y.			NL
Kings Point Pond	N.Y.	15 A	bio	OTH
Scully Wildlife Sanctuary	N.Y.		bio	AUD
Smoky Hollow Bog	N.Y.	20 A	bio	OTH
Sunken Forest	N.Y.	73 A	bio	OTH
Theodore Roosevelt Memorial Sanctuary	N.Y.		bio	AUD
Tobay Pond Wildlife Preserve	N.Y.	500 A	bio	OTH
Wertheim National Wildlife Refuge	N.Y.	11 A	bio	NFW
Wildwood State Park	N.Y.	775 A	geo	SP
Wolf Swamp Sanctuary	N.Y.	20 A	bio	OTH

BASIN 14

Nearly two-thirds of the basin consists of Rolling Hills. This includes not only the heavily urbanized areas but the upper portion of the basin as well, containing woods, hills and lakes which is only one hour driving time from the metropolitan core. Over one-half (52%) of the area consists of City Landscape Units. The remainder of the area consists of Town-Farm and Forest-Town landscape patterns, two-thirds of which have a combined evaluation of low. The remainder is evaluated as of medial quality.

The intensity of urbanization varies and population density ranges from 13,752 people per square mile in Hudson County to 124 in Hunterdon County (1960 census).

There are four National Natural Landmarks in the basin. One, Great Swamp, is dedicated to migratory waterfowl management and has 3700 acres set aside as a Wilderness Area. Troy Meadows, another Landmark, is considered to be one of the most productive inland wetlands in the eastern United States, both as wildlife habitat and as a recharge aquifier. It is vital in flood control and has been used for scientific study for many years.

Major needs for this basin include: developing quality landscape over 17% of the basin, protecting landscape diversity in 4%, developing clean water in the entire basin and providing amenities for the metropolitan area.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Rolling Hills	1500 sq.mi.	City	1200 sq.mi.
Undulating Land	800 sq.mi.	Town-Farm	800 sq.mi.
		Forest-Town	300 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 14

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Protect Landscape Diversity (sq.mi.)	30	30	30	15	15	15
Develop Landscape Quality (sq.mi.)	130	130	130	65	65	65
Develop Clean Water (% of basin)	100%			100%		
Develop Metropolitan Amenities (sq.mi.)	60			30	30	
Develop Metropolitan Amenities (linear mi.)	2			2		
LEGAL DEVICES						
Fee Simple (sq.mi.)	205	145	145	30	30	
Fee Simple (linear mi.)	2			2		
Purchase-Lease Back (sq.mi.)				65	65	65
Easements (sq.mi.)	15	15	15	15	15	15
OTHER DEVICES						
Impoundment	x	x	x	x	x	x
Water Supply	x	x	x	x	x	x
Waste Treatment	x			x		
Recreation Facility	x	x	x	x	x	x
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Corrective Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	125.4	70.4	70.4	75.9	47.9	34.4
Annual Return				0.6	0.6	0.6

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	New Jersey			
Ringwood Manor 1742, 1815	Hewitt vicinity		SITE	NHL
Morristown National Historic Park, 1777-8; 1779-80	Morristown	1224 A	SITE	NPS
Nast (Thomas) Home, Villa Fontana, 1860-1	Morristown		BLDG	NHL
Cleveland (Grover) House, Westland, 1854	Princeton		BLDG	NHL
Henry (Joseph) House 1837	Princeton		BLDG	NHL
Nassau Hall, Princeton University, 1754-6	Princeton		BLDG	NHL
Princeton Battlefield, 1777	Princeton	40 A	SITE	NHL
Edison National Historic Site, 1887, 1880	West Orange	20 A	BLPX	NPS
Boudinot Mansion	N.J.	.4 A		SHM
Old Dutch Parsonage	N.J.	.5 A		SHM
Rockingham	N.J.	2 A		SHM
Von Steuben House	N.J.	1 A		SHM
Wallace House	N.J.	1 .5 A		SHM
	New York			
De Wint House, 1700	Tappan		BLDG	NHL

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Great Falls of Patterson	N.J.		geo	NL
Great Swamp	N.J.		bio	NL
Palisades Interstate Park	N.J.	1900 A	bio	SP
Troy Meadows National Wildlife Refuge	N.J.	1089 A	bio	NFW NL
Waywaywanda Lake	N.J.	10000 A	bio	POT

BASIN 15

There is a great diversity of land form as the basin contains all Landscape Series. Rolling Hills Series is the most extensive of the Series and covers about 42% of the basin. About one-fifth of the basin is composed of City Landscape Units. The remainder is diverse and is represented by all of the rural Landscape Units. 26% of the basin is in Town-Farm Unit pattern and another 29% is in Forest-Town. 15% is in Farm and Farm-Forest. The Forest-Wildlands comprises the remaining 9%. 85% of the rural units are of medial quality and the remaining area is of low quality. Although the visual quality of the individual landscape units is not high, the overall quality of the river basin is high since it possesses a great diversity in land form and in land pattern.

Population density varies from 34 persons per square mile in the northern part to 945 in the south. The average density is 531.

The needs of this basin include: preservation or protection of certain unique natural landscapes and 16 miles of shoreline, protecting composite landscapes, developing clean water and providing metropolitan amenities.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Mountains	100 sq.mi.	City	2600 sq.mi.
Steep Hills	900 sq.mi.	Town-Farm	3100 sq.mi.
Rolling Hills	5200 sq.mi.	Farm	1900 sq.mi.
Undulating Land	3900 sq.mi.	Farm-Forest	200 sq.mi.
Flat Land	1200 sq.mi.	Forest-Town	3600 sq.mi.
Composite	1200 sq.mi.	Forest-Wildland	1100 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 15

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Preserve Coastline (linear mi.)	16			8		
Protect Landscape Diversity (sq.mi.)	1200	1200	1200	800	800	800
Protect Agricultural Valleys (sq.mi.)	800			800		
Develop Clean Water (% of basin)	70%	100%		70%	100%	
Develop Metropolitan Amenities (sq.mi.)	180			180		
LEGAL DEVICES						
Fee Simple (sq.mi.)	780	600	600	180		
Fee Simple (linear mi.)	16			8		
Easements (sq.mi.)	600	600	600	500	500	500
Purchase-Lease Back (sq.mi.)	800			580		
Zoning and/or Tax Incentive-Subsidy (sq.mi.)				700	300	300
OTHER DEVICES						
Impoundment	x			x		
Water Supply	x			x		
Waste Treatment	x	x		x	x	
Recreation Facility	x			x		
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x			x		
Corrective Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	1187.0	350.0	350.0	542.0	130.0	130.0
Annual Cost*				2.0	2.0	2.0
Annual Return	8.0			6.0		

* See Footnote for Basin 2

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Delaware			
Dickinson House 1740	Dover Vicinity		BLDG	NHL
New Castle Historic District, 17, 18, 19 and 20 century	New Castle	most of town	DIST	NHL
Corbit-Sharp House 1772-4	Odessa		BLDG	NHL
Fort Christina 1638	Wilmington		SITE	NHL
Holy Trinity (Old Swedes) Church, 1698	Wilmington		BLDG	NHL
Eleutherian Mills, 1801	Wilmington vicinity		BLDG	NHL
Fort Delaware State Park	Delaware	2 A		SHM
DeVries Monument	Delaware			SHM
Old Courthouse	Delaware			SHM
Presbyterian Church	Delaware			SHM
Old State House	Delaware			SHM
	New Jersey			
Whitman (Walt) House c. 1848	Camden		BLDG	NHL
Hancock House	N.J.	1.3 A		SHM
Indian King Tavern	N.J.	.2		SHM
Oxford Furnace	N.J.	.6		SHM
Trenton Battle Monument	N.J.	.1		SHM
Lawrence House	N.J.	.2		SHM
	New York			
Old Blenheim Bridge, 1855	North Blenheim		STRC	NHL
	Pennsylvania			
Brandywine Battlefield 1777	Chadd's Ford		BLPX	NHL
Cornwall Iron Furnace 1742	Cornwall		STRT	NHL

HISTORIC AREAS (cont'd.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Brinton (William) House, 1704 House, 1704	Dilworthtown vicinity		BLDG	NHL
The Printzhof, c.1643	Essington		SITE	NHL
Graeme Park, 1721-2	Horsham vicinity		BLDG	NHL
Pinchot (Gifford) House Grey Towers, c.1886	Milford		BLDG	NHL
Hopewell Village National Historic Site, 1770-1883	Morgantown vicinity	848 A	SITE BLDG	NPS
Valley Forge, 1777-8	Norristown vicinity		SITE	NHL
Academy of Music, 1857	Philadelphia		BLDG	NHL
American Philosophical Society Hall, 1789	Philadelphia		BLDG	NHL
Bartram (John) House 1731	Philadelphia		BLDG	NHL
Chew House, 1763	Philadelphia		BLDG	NHL
Coleman (William) House, Woodford, 1734; 1756	Philadelphia		BLDG	NHL
Eakins (Thomas) House c. 1854	Philadelphia		BLDG	NHL
Eastern State Penitentiary 1823-9	Philadelphia		BLDG	NHL
Elfreth's Alley Historic District,17 & 18 century	Philadelphia		DIST	NHL
Germantown Historic District,18 & 19 century	Philadelphia		DIST	NHL
Gloria Dei (Old Swede's) Church National Historic Site, 1698; 1700	Philadelphia	3.5 A	BLDG	NPS

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Hamilton (William) House The Woodlands, c. 1770	Philadelphia		BLDG	NHL
Independence National Historical Park, 18 cent.	Philadelphia	22 A	DIST	NPS
Institute of the Pennsylvania Hospital, 1859	Philadelphia		BLDG	NHL
Logan (James) Home, Stenton 1730	Philadelphia		BLDG	NHL
MacPherson (John) House Mount Pleasant,1761-2	Philadelphia		BLDG	NHL
New Market, 1745	Philadelphia		BLDG	NHL
U.S.S. Olympia 1888	Philadelphia		STRT	NHL
Peale (Charles Willson) House, Belfield, c.1750	Philadelphia		BLDG	NHL
The Pennsylvania Hospital, 1756	Philadelphia		BLDG	NHL
Poe (Edgar A.) House c. 1830	Philadelphia		BLDG	NHL
Reynolds-Morris House 1786-7	Philadelphia		BLDG	NHL
Sully (Thomas) Residence 1796	Philadelphia		BLDG	NHL
Walnut Street Theatre,1809	Philadelphia		BLDG	NHL
Biddle (Nicholas) Estate, Andalusia 1794;1834	Philadelphia vicinity		BLDG	NHL
West (Benjamin) Birthplace 1724	Swarthmore		BLDG	NHL
Augustus Lutheran Church 1743	Trappe		BLDG	NHL

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Weiser (Conrad) House 1751	Womelsdorf vicinity		BLDG	NHL
Washington Crossing State Park, 1776	Yardley vicinity		BLPX	NHL
Daniel Boone Homestead	Pa.	192 A		SHM
Ft. Washington State Park	Pa.	483 A		SHM
Hope Lodge	Pa.	40 A		SHM
Logan State Project	Pa.	300 A		SP
Morton Homestead	Pa.	2 A		SHM
Pottsgrove Mansion	Pa.	1 A		SHM
Roosevelt State Park	Pa.	600 A		SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Becks Pond and Sunset Lake	Del.	500 A	bio	POT
Bombay Hook National Wildlife Refuge	Del.	13180 A	bio	POT
Brandywine Creek	Del.	2000 A	bio	POT
Chesapeake & Delaware Canal	Del.	5000 A	bio	NRA
Churchmans Marsh	Del.	1500 A	bio	POT
Killen, Coursey & McCauley Ponds	Del.	3600 A	bio	POT
Lums Pond	Del.	1920 A	bio	POT
Cat Swamp	N.J.	800 A	bio	POT
Cox Hall Creek	N.J.	200 A	bio	POT
Higbee Beach	N.J.	1600 A	bio	POT
High Point State Park	N.J.	10935 A	bio	SP
Killcohook National Wildlife Refuge	N.J.	907 A	bio	NFW

NATURAL AREAS (con't.)

SITE	LOCATION	AREA	FEATURE	CLASS
Raritan Arsenal	N.J.	3500 A	bio	POT
Tocks Island Recreation Area	N.J.	44210 A	bio, wild	POT
William L. Hutchinson Memorial Forest	N.J.	135 A	bio	POT
Worthington Tract Wilderness Area	N.J.	6200 A	wild	SNA
Bear Creek	Pa.	3445 A	bio	SP
Big Pocono State Park	Pa.	1306 A	bio	SP
Bruce Lake State Forest Monument	Pa.	2300 A	bio,geo wild	SF
Buck Hill Halls	Pa.	2600 A	bio,geo	POT
Cranberry Bog	Pa.	72 A	bio	OTH
French Creek Falls	Pa.	580 A	bio	POT
French Creek State Park	Pa.	5883 A	bio	SP
George W. Childs State Park	Pa.	154 A	bio,geo	SP
Gouldsboro State Park	Pa.	3055 A	bio	SP
Hawk Mountain	Pa.	2418 A	bio	NL
Hickory Run State Park	Pa.	15486 A	bio,geo	SP
Hickory Run Boulder Field	Pa.			NL
Jacobsburg State Park Project	Pa.	523 A	bio	SP
Money Island	Pa.	300 A	bio	OTH
Mud Run	Pa.	2500 A	bio	POT
Pine Creek	Pa.	3700 A	bio	POT
Promised Land State Park	Pa.	2339 A	bio	SP
Ralph Stover State Park Project	Pa.	47 A	bio,geo	SP
Shohola Falls	Pa.	2000 A	bio,geo	POT
Stillwater State Forest Monument	Pa.	3400 A	bio,geo wild	SF

NATURAL AREAS (Con't.)

SITE	LOCATION	AREA	FEATURE	CLASS
Tinicum Wildlife Preserve	Pa.			NL
Tobyhanna State Park	Pa.	4188 A	bio	SP
Tocks Island Recreation Area	Pa.	70482 A	bio,geo wild	POT
Towhickon State Park Project	Pa.	5650 A	bio	SP
Trexler Preserve	Pa.	1107 A	bio	POT
Wissahickon Valley	Pa.			NL

Additional sites identified by the Pennsylvania Department of Forests and Waters.

SITE	LOCATION	FEATURE
Ringing Rocks	Berks	geo
Elmont Area	Bucks	bio
Upright Cedars	Bucks	bio
Nockamixon Cliffs	Bucks	bio, geo
Preston Run Barrens	Delaware	bio
Glen Onoko	Carbon	bio,geo
Lehigh Canal	Carbon	geo
Centerfield Coral Reef	Monroe	geo
Getz Swamp	Northampton	bio
Blue Mt. Geological Offsets	Northampton	bio, geo
12 Mile Pond	Pike	bio
White Bird Swamp	Pike	bio
Palisades Area	Pike	bio,geo
Scott Township	Wayne	bio
Overlook Cliff	Wayne	bio,geo

BASIN 16

75% of the Basin is in the Flat Land Series and 25% in the Undulating Land Series. 20% of all the Flat Land in the NAR is found in this basin. Approximately 19% of Basin 16 is in City Landscape Units. The majority of the basin (57%) is in Forest-Town Units of low quality; 24% is a Town-Farm pattern. The major part of the basin is of low visual quality and only 10% is of medial quality.

Population density varies from 900 persons per square mile in the north to 157 in the south. The average density for the entire area was 272 in the 1960 census.

Included in this basin is 100 miles of Jersey shore, an area rich in plant variety, and of fish and waterfowl habitat. This is one of the great flyways for migratory waterfowl. Bird sanctuaries are also numerous along the coast. In addition to national preserves, Egg Harbor, Island Beach State Park, Stone Harbor, Sandy Hook State Park and Cape May Point sanctuaries are notable. Of these, both Island Beach State Park and Sandy Hook State Park have natural areas of significance. Sandy Hook has the largest stand of holly on the Atlantic Coast with some 50 foot high trees estimated to be 300 years old. The Pine Barrens, a unique wild area of one and two-thirds million acres provides wilderness, recreation and an excellent source of very old vegetation and natural habitat for scientific study. The northern portion of the barrens is less than 100 miles from New York City.

The needs of the basin include: the preservation or protection of 30 miles of shoreline and 300 square miles of unique natural landscapes (Pine Barrens); developing 100 square miles of quality landscape, obtaining clean water and the provision of metropolitan amenities.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Undulating Land	600 sq.mi.	City	400 sq.mi.
Flat Land	1500 sq.mi.	Town-Farm	500 sq.mi.
		Forest-Town	1200 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 16

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Preserve Unique Landscape (sq.mi.)	300			300		
Preserve Coastline (linear mi.)	30			30		
Develop Landscape Quality (sq.mi.)	100	100	100	50	50	50
Develop Clean Water (% of basin)	100%			100%		
Develop Metropolitan Amenities	16			16		
LEGAL DEVICES						
Fee Simple (sq.mi.)	416	100	100	150		
Fee Simple (linear mi.)	30			15		
Purchase-Lease Back (sq.mi.)				66	50	50
Zoning (sq.mi.)				150		
Zoning (linear mi.)				15		
OTHER DEVICES						
Impoundment	x	x	x	x	x	x
Water Supply	x	x	x	x	x	x
Waste Treatment	x			x		
Recreation Facility	x	x	x	x	x	x
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Corrective Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	576.0	50.0	50.0	194.0	25.0	25.0
Annual Return				0.8	0.5	0.5

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	New Jersey			
Monmouth Battlefield,1778	Freehold vicinity	1½ by 3 miles	SITE	NHL
Hangar #1, Lakehurst Naval Air Station, 1921	Lakehurst vicinity		BLPX	NHL
Sandy Hook Light,1764	Sandy Hook		STRT	NHL
Carranza Memorial		10 A		SHM
Sommers Mahsion		.4 A		SHM
Veteran's All Wars Memorial		2 A		SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Absecon Inlet	N.J.	600 A	bio	POT
Brigantine National Wildlife Refuge	N.J.	12855 A	bio	NFW
Island Beach State Park		2200 A	bio	SP
Lebanon State Forest	N.J.	22185 A	bio	SF
North Hereford Inlet	N.J.	50 A	bio	POT
Seven Mile Beach	N.J.	360 A	bio	POT
Stone Harbor Bird Sanctuary	N.J.		bio	NL
West Cape May Beach	N.J.	200 A	bio	POT

BASIN 17

Nearly one-fourth of this, the largest of the basins in the NAR, consists of the Composite Series. More than 47% is of Rolling Hills and about 24% is Steep Hills. There is a small amount of Undulating Land (5%). 60% of all the Composite Series in the NAR is found in this basin. The pattern distribution finds 30% of the area in Town-Farm Units, 8% in Farm, 27% in Forest-Town, 30% in Forest-Wildland and 5% in City Units. The combined quality ranking is fairly equally distributed between medial and low quality. Water is not an abundant visual resource. About 1% of the basin is water surface.

The average population density is 116 (1960 census).

Because of the size and variation in development of the basin, different objectives pertain to different areas, i.e., the industrialization of the northern tier or the recreational resource of the more rural western portions. The uniqueness of the Amish, Mennonite and Brethren farming communities indicates consideration for state or even national agricultural park status. The major agricultural valley and the valleys between the north-south ridges provide additional variety in pattern in the landscape. Needs include the protection of composite landscapes, protecting agricultural valleys, providing metropolitan amenities and developing clean water.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Steep Hills	6700 sq.mi.	City	1300 sq.mi.
Rolling Hills	13000 sq.mi.	Town-Farm	8400 sq.mi.
Undulating Land	1300 sq.mi.	Farm	2200 sq.mi.
Compound	6500 sq.mi.	Forest-Town	7400 sq.mi.
		Forest-Wildland	8200 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 17

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Protect Landscape Diversity (sq.mi.)	300	300	300	300	300	300
Protect Agricultural Valleys (sq.mi.)	250			250		
Develop Landscape Diversity (sq.mi.)	300			150		
Develop Clean Water (% of Basin)	25%			25%		
Develop Metropolitan Amenities (sq.mi.)	75			40	35	
LEGAL DEVICES						
Fee Simple (sq.mi.)	775	150	150			
Purchase-Lease Back (sq.mi.)				315	35	
Easements (sq.mi.)	150	150	150	150	150	150
Zoning and/or Tax Incentive-Subsidy (sq.mi.)				275	150	150
OTHER DEVICES						
Impoundment	x			x	x	
Water Supply	x			x		
Waste Treatment	x			x		
Recreation Facility	x			x		
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Corrective Flood Plain Management	x			x		
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	325.0	67.5	67.5	197.0	46.5	30.0
Annual Cost*				3.0	1.5	1.5
Annual Return				3.0	0.3	

* See Footnote for Basin 2

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	New York			
Lamoka, c.3500 B.C.	Tyrone vicinity		SITE	NHL
Newtown Battlefield Reservation		330 A		SP
Robert H. Treman State Park		989 A		SP
	Pennsylvania			
Horseshoe Curve; 1854	Altoona vicinity		STRT	NHL
Stiegel-Coleman House; 1756-8, c. 1780	Brickerville		BLDG	NHL
Carlisle Indian School 1879-1918	Carlisle		BLDG	NHL
Old West, Dickinson College; 1804-22	Carlisle		BLDG	NHL
Ephrata Cloister; 1740-6	Ephrata		BLDG	NHL
Eisenhower National Historic Site; 1950's	Gettysburg Vicinity	230 A	SITE	NPS
Gettysburg National Military Park; 1863	Gettysburg	3672 A	SITE	NPS
Allegheny Portage Railroad National Historic Site 1831-4	Johnstown vicinity	950 A	STRT	NPS
Buchanan (James) House; Wheatland; 1828	Lancaster		BLDG	NHL
Priestly (Joseph) House c. 1794	Northumberland		BLDG	NHL
Fulton (Robert) Birthplace; c. 1765	Quarryville vicinity		BLDG	NHL

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
East Broad Top Railroad 1872	Rockhill Furnace		STRT	NHL
Powderly (Torrence) House c. 1870's-1890's	Scranton		BLDG	NHL
Admiral Perry Park		4 A		SHM
Ft. Augusta		1 A		SHM
Greenwood Furnace State Park		382 A		SP
Pine Grove State Park		612 A		SP
Pennsylvania Farm Museum				SHM
28th Division Shrine		75 A		SHM
Warrior Run Church		1 A		SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Rocks State Park	Md.	203 A	bio	SP
Susquehanna National Wildlife Refuge	Md.	4 A	bio	NFW
Moss Lake Nature Sanctuary	N.Y.	80 A	bio	OTH
Stony Brook State Park	N.Y.	554 A	geo	SP
Abraham Creek State Park	Pa.	1410 A	bio	SP
Alan Seeger State Forest Monument	Pa.	285 A	bio	SF
Allegheny National Forest	Pa.(small portion in NAR)	471000 A	bio,geo wild	NFS

NATURAL AREAS (Con't.)

SITE	LOCATION	AREA	FEATURE	CLASS
Archbald Pothole State Forest Monument	Pa.	145 A	geo	SF
Bear Meadows State Forest Monument	Pa.	550 A	bio	SF NL
Black Moshannon State Park	Pa.	2150 A	bio	SP
Blue Knob State Park	Pa.	5597 A	bio,wild	SP
Box Huckleberry Site	Pa.			NL
Bucktail State Park	Pa.	23013 A	bio	SP
Centre County Barrens	Pa.	7000 A	bio,geo wild	POT
Clarion River State Park	Pa.	1150 A	bio	SP
Colonel Denning State Park	Pa.	67 A	bio	SP
Colton Point State Park	Pa.	238 A	bio,geo	SP
Conewago Creek	Pa.	3500 A	bio	POT
Cowans Gap State Park	Pa.	1388 A	bio	SP
Curwensville State Park	Pa.	1340 A	bio	SP
Detweiler Run State Forest Monument	Pa.	200 A	bio	SF
Fishing Creek Falls	Pa.	300 A	bio,geo	POT
Gifford Pinchot State Park	Pa.	3140 A	bio	SP
Hemlocks State Forest Monument	Pa.	80 A	bio	SF
High Knob State Forest Monument	Pa.	22 A	bio	SF
Hills Creek State Park	Pa.	544 A	bio	SP
Hyner Run State Park	Pa.	17 A	bio	SP
Ice Mine (Scientific Monument)	Pa.	1200 A	geo	POT
Kettle Creek State Park	Pa.	1370 A	bio	SP
Leonard Harrison State Park	Pa.	961 A	bio,geo, wild	SP

NATURAL AREAS (con't.)

SITE	LOCATION	AREA	FEATURE	CLASS
Little Pine State Park	Pa.	500 A	bio	SP
Lyman Run State Park	Pa.	60 A	bio	SP
Meshopen Falls	Pa.	3500 A	bio	POT
Nimchism State Park Project	Pa.	400 A	bio	SP
Ole Bull State Park	Pa.	67 A	bio	SP
Parker Dam State Park	Pa.	960 A	bio	SP
Pine Grove Furnace State Park	Pa.	612 A	bio	SP
Poe Valley State Park	Pa.	785 A	bio	SP
Prince Gallitzin State Park	Pa.	3359 A	bio	OTH
Raptown Reservoir	Pa.	41800 A	bio,geo	OTH
Ravensberg State Park	Pa.	426 A	bio	SP
R. B. Winter State Park	Pa.	587 A	bio	SP
Reeds Gap State Park	Pa.	250 A	bio	SP
Ricketts Glen State Park	Pa.	13387 A	bio,geo	SP
Samuel S. Lewis State Park	Pa.	71 A	bio,geo	SP
S. B. Elliot State Park	Pa.	721 A	bio	SP
Shawnee State Park	Pa.	3840 A	bio	SP
Shikellmany State Park	Pa.	67 A	geo	SP
Sizerville State Park	Pa.	1390 A	bio	SP
Snyder-Middlesworth State Park	Pa.	500 A	bio	SP NL
Stillwater Reservoir	Pa.	424 A	bio	Corp of E.
Trough Creek State Park	Pa.	352 A	bio	SP
Wapwallopen Creek	Pa.	3000 A	bio	POT
Woodbourne Forest	Pa.	478 A	bio	OTH
World's End State Park	Pa.	1891 A	bio,geo	SP
Yellow Creek State Park	Pa.	6000 A	bio	SP

Additional sites identified by the Pennsylvania Department of Forests and Waters

SITE	LOCATION (COUNTY)	FEATURE
Sky Top	Centre	geo.
Bilgers Rocks	Clearfield	geo.
Clearfield Fossil Bed	Clearfield	geo
Tamarack Swamp	Clinton	bio
Extramorainic Bog	Clinton	bio
Mount Holly Springs Area	Cumberland	geo,bio
Boiling Springs	Cumberland	geo
Enterline Swamp	Dauphin	bio
Macedonia Gap	Junia	geo,bio
Lackawanna Valley Vista	Lackawanna	geo
Dinosaur Rock	Lebanon	geo,bio
St. Anthony's Wilderness Area	Lebanon	geo,bil
Walnut Springs	Lebanon	geo,bio
Gleisners Swamp	Lancaster	bio
Lees Bridge (Serpantine Barrens)	Lancaster	bio
Wood Mine Chromite Area	Lancaster	geo
Box Huckleberry	Perry (Watts)	bio
Box Huckleberry	Perry (New Bloomfield)	bio
Powder Mill Reserve	Westmoreland	bio

BASIN 18

The predominant land form of Basin 18 is Flat Land (over 60%). Slightly more than one-fifth is Undulating Land, less than one-fifth is Rolling Hills. Over half of all the flat land in the NAR is found here. Farm-Forest pattern dominates --covering 40% of the basin, with Farm comprising 31% and Town-Farm 19%. About one-tenth of the basin is in City Units. The overall quality evaluation ranks two-thirds as medial and about one-third as low.

Population density averages 260 persons per square mile but ranges from 674 in the western subregion to 54 in the eastern subregion.

There are 65 miles of the Delaware Nanticoke River-Broad Creek which are classified as free flowing and 70 miles of the Pocomoke River as well. A clustering of historic sites (5) is found at Annapolis. The Chesapeake Bay is the most significant resource in the basin. It is a major producer of nursery fish and therefore vitally important to the commercial and recreational fish industry of the Atlantic Seaboard. Waterfowl habitat in the Bay provides the major over-wintering area for migratory waterfowl and is essential to the North Atlantic Flyway.

Major needs are the preservation or protection of 350 square miles of unique natural landscape and 350 miles of shoreline, development of quality landscapes, protection of composite landscapes and the development of metropolitan amenities and clean water.

The Maryland Planning Department has compiled a Catalog of Natural Areas in Maryland which provides a very comprehensive inventory of the areas of unique historical, geological or ecological value which are of at least statewide significance. A brief description of each of the areas and information on the possible dangers to the integrity of the areas is also included in the Catalog.

NEEDS, DEVICES AND COSTS - BASIN 18	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Preserve Unique Landscape (sq.mi.)	350			350		
Preserve Coastline (linear mi.)	350			350		
Protect Landscape Diversity (sq.mi.)	300	300	300	300	300	300
Develop Landscape Quality (sq.mi.)	200	200	200	100	100	100
Develop Clean Water (% of basin)	50%			50%		
Develop Metropolitan Amenities (sq.mi.)	35			35		
LEGAL DEVICES						
Fee Simple (sq.mi.)	735	350	350	175		
Fee Simple (linear mi.)	350			175		
Purchase-Lease Back				135	100	100
Easements (sq.mi.)	150	150	150	150	150	150
Zoning (sq.mi.)				175		
Zoning (linear mi.)				175		
Zoning and/or Tax Incentive-Subsidy (sq.mi.)				150	150	150
OTHER DEVICES						
Impoundment	x	x	x	x	x	x
Water Supply	x	x	x	x	x	x
Waste Treatment	x			x		
Recreation Facility	x	x	x	x	x	x
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Corrective Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	2882.0	136.0	136.0	1434.5	57.5	57.5
Annual Cost*				0.5	0.5	0.5
Annual Return				0.8		

* See Footnote for Basin 2

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Rolling Hills	1100 sq.mi.	City	700 sq.mi.
Undulating Land	1300 sq.mi.	Town-Farm	1400 sq.mi.
Flat Land	4400 sq.mi.	Farm	2300 sq.mi.
		Farm-Forest	2900 sq.mi.

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Maryland			
Colonial Annapolis Historic District; 17,18 century	Annapolis		DIST	NHL
Hammond-Harwood House c. 1774	Annapolis		BLDG	NHL
Maryland Statehouse,c.1772	Annapolis		BLDG	NHL
US Naval Academy, 1845	Annapolis		DIST	NHL
Whitehall, c, 1765	Annapolis		BLDG	NHL
Baltimore & Ohio Transportation Museum & Mt. Clare Station, 1830	Baltimore		BLDGS	NHL
USS Constellation,1797	Baltimore		STRT	NHL
Ft. McHenry National Monument & Historic Shrine, 1794-1803	Baltimore	43 A	STRT	NPS
Peale's Baltimore Museum, 1814	Baltimore		BLDG	NHL

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Old Lock Pump House, Chesapeake & Delaware Canal, 1837	Chesapeake City		STRT	NHL
Ellicott City Station 1830-31	Ellicott City		BLDG	NHL
Thomas Viaduct, B & O Railroad, 1835	Relay		STRT	NHL
Hampton National Historic Site;1783-90	Towson	45 A	BLPX	NPS
Chesapeake & Ohio Canal National Monument 1828-1924	Md. W. Va., & Washington,D.C.	4474 A	STRTS	NPS
Ft. Cumberland				OTH
Jonathan Hager House				OTH
Johns Hopkins University				OTH
Roger B. Taney House				OTH
St. John's College				OTH
Wye Oak State Park				SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Cape Henlopen	Del.	1200 A	bio,geo	POT
Delaware Beach Lands	Del.	1900 A	bio	SP
Delaware Dunes	Del.	1200 A	bio,geo	POT
Long Neck Area	Del.	1500 A	bio	POT

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Trap Pond State Park	Del.	927 A	bio	SP
Trussem Pond	Del.		bio	POT
Battle Creek Cypress Swamp	Md.	100 A	bio,geo	NL
Blackwater National Wildlife Refuge	Md.	11216 A	bio	NFW
Chesapeake & Delaware Canal	Md.	500 A	bio	NRA
Chincoteague National Wildlife Refuge	Md.	418 A	bio	NFW
Gunpowder River Valley State Park	Md.	1200 A	geo	SP
Hellen Creek Hemlock	Md.	21 A	bio	OTH
Martin National Wildlife Refuge	Md.	2482 A	bio	NFW
Patapsco State Park	Md.	6278 A	geo	SP
Chincoteague National Wildlife Refuge	Va.	9030 A	bio	NFW
Cliffs of Calvert	Va.	185 A	geo	POT
Michael's Marsh	Va.	2500 A	bio	SNA
Mockhorn Island Refuge	Va.	9100 A	bio	SNA
Offshore Islands	Va.	4200 A	bio,wild	POT
Parkers Marsh	Va.	759 A	wild,bio	SNA
Parramore Island	Va.	6255 A	bio	POT
Wreck Island	Va.	920 A	wild,bio	SNA

BASIN 19

Diversity of land form in the Potomac Basin is a product of: 20% Mountain, 8% Steep Hill, 29% Rolling Hill, 22% Undulating Land and 21% Compound Series. In addition to 6% City Units, Landscape Units include 34% Farm, 11% Farm-Forest, 43% Forest-Wildland and 6% Forest-Town. The combined quality ranking is approximately two-thirds medial and one-third low quality landscape.

Population density averages 202 (1960 census).

150 miles of the Potomac River in Maryland and 85 miles of the South Branch of the Potomac in West Virginia are classified as free flowing streams. 80 miles of the Cacapon River in West Virginia is also classified as free flowing. Clusters of historic sites occur at Washington, D.C. (27).

Needs are the preservation or protection of 90 miles of shoreline, 1000 square miles of unique natural landscape, the protection of composite landscapes and the agricultural valley and the development of clean water and metropolitan amenities.

The publication of the joint federal-state planning team on landscape and recreation in this basin entitled Potomas Valley, 1966, provides valuable information on the character, needs and potential of the basin. Key areas have been singled out for protection or development.

Other publications of value include Virginia's Scenic Rivers, part of the Virginia Outdoor Plan 1969 which includes a descriptive inventory of rivers in Virginia which have been recommended as worthy of preservation. The Catalog of Natural Areas in Maryland, a report of the Maryland Planning Department is a very comprehensive inventory of areas of unique historical, geological or ecological value and of at least statewide significance. A complete description of each area and information on the preservation status of each area is provided in the Catalog.

NEEDS, DEVICES AND COSTS - BASIN 19

	Environmental Quality 1980	Environmental Quality 2000	Environmental Quality 2020	National Efficiency 1980	National Efficiency 2000	National Efficiency 2020
NEEDS						
Preserve Unique Landscape (sq.mi.)	1000			1000		
Preserve Coastline (linear mi.)	90			90		
Protect Landscape Diversity	400	400	400	400	400	400
Protect Agricultural Valleys (sq.mi.)	2000			2000		
Develop Clean Water (% of basin)	70%			70%		
Develop Metropolitan Amenities (sq.mi.)	40			20	20	
LEGAL DEVICES						
Fee Simple (sq.mi.)	1090			500		
Fee Simple (linear mi.)	90			45		
Purchase-Lease Back (sq.mi.)	2000			1020	20	
Easements (sq.mi.)	350	400	400	350		
Zoning (sq.mi.)				200		
Zoning (linear mi.)				45		
Zoning and/or Tax Incentive-Subsidy (sq.mi.)				1350	400	400
OTHER DEVICES						
Impoundment	x			x	x	
Water Supply	x			x		
Waste Treatment	x			x		
Recreation Facility	x			x	x	
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Corrective Flood Plain Management	x			x	x	
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	1263.6	97.3	97.3	668.0	12.0	
Annual Cost*				6.0	1.7	1.7
Annual Return	16.4			8.4	0.2	

* See Footnote for Basin 2

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Mountain	2800 sq.mi.	City	800 sq.mi.
Steep Hills	1200 sq.mi.	Farm	4900 sq.mi.
Rolling Hills	4200 sq.mi.	Farm-Forest	1600 sq.mi.
Undulating Land	3200 sq.mi.	Forest-Town	900 sq.mi.
Compound	3100 sq.mi.	Forest	6300 sq.mi.

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Maryland			
Accokeek Creek Site c. 4000 B.C.	Accokeek vicinity		SITE	NHL
Antietam National Battlefield Site, 1862	Sharpsburg	784 A	SITE	NPS
Barton, (Clara) House c. 1890	Glen Echo		BLDG	NHL
Piscataway Park 3000 B.C.-1800 A.D.	Accokeek vicinity	1092 A	SITE	NPS
Dans Mountain State Park		322 A		SP
Ft. Tonoloway State Park		279 A		SHM
Gathland State Park		126 A		SHM
Smallwoods Retreat State Park		333 A		SHM
Washington Monument State Park		104 A		SHM
	Virginia			
Alexandria Historic District, 18, 19 century	Alexandria		DIST	NHL
Gadsby's Tavern, 1752, 1792	Alexandria		BLDG	NHL

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Gunston Hall, 1755-8	Alexandria		BLDG	NHL
Washington Plantation, Mt. Vernon, 1743	Alexandria vicinity		BLDG	NHL
Custis-Lee Mansion;1802-17	Arlington vicinity	3 A	BLDG	NPS
Monroe (James) House, Oak Hill; 1820-3	Leesburg vicinity		BLDG	NHL
Manassas National Battlefield Park; 1861-2	Manassas vicinity	3109 A	SITE	NPS
McCormick (Cyrus) Farm & Workshop; early 1800's	Staunton vicinity		BLDGS	NHL
Wilson (Woodrow) Birthplace; 1846	Staunton		BLDG	NHL
Jackson (Thomas J.) Headquarters; 1854	Winchester		BLDG	NHL
Balls Bluff Battlefield				SHM
Saylers Creek Battlefield		221 A		SHM
	District of Columbia			
Administration Building, Carnegie Institution of Washington; 1910	Washington DC		BLDG	NHL
American National Red Cross; 1915-17	Washington DC		BLDG	NHL
Battleground National Cemetery, 1864	Washington DC	1 A	SITE	NPS
Chapel Hall, Gallaudet College; 1870	Washington DC		BLDG	NHL
City Hall (District Courthouse) 1820-49	Washington DC		BLDG	NHL

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
Decatur House 1818-19;1944	Washington DC		BLDG	NHL
Frederick Douglass Home National Memorial; 1855	Washington DC	8 A	BLDG	NPS
Ford's Theatre (Lincoln Museum) 1863	Washington DC	.2 A	BLDG	NPS
Georgetown Historic District 18,19,20 century	Washington DC		DIST	NHL
House Where Lincoln Died; 1849	Washington DC	.05 A	BLDG	NPS
Jefferson Memorial 1943	Washington DC	18 A	BLDG	NPS
Library of Congress; 1886-7	Washington DC		BLDG	NHL
Lincoln Memorial; 1922	Washington DC	164 A	BLDG	NPS
Medical Museum	Washington DC		BLDG	NHL
Octagon House; 1800	Washington DC		BLDG	NHL
Old Naval Observatory;1844	Washington DC		BLDG	NHL
Old Patent Office; 1840, 1849-51,1851-67	Washington DC		BLDG	NHL
Pennsylvania Avenue National Historic Site, 18,19,20 century	Washington DC		DIST	NPS
Philadelphia (gundelo)1776	Washington DC		STRT	NHL
Richards (Zalmon) House mid 19 century	Washington DC		BLDG	NHL
St. John's Episcopal Church; 1816,1833	Washington DC		BLDG	NHL
Smithsonian Bldg. 1855	Washington DC		BLDG	NHL
Tudor Place; c.1815	Washington DC		BLDG	NHL

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
U.S. Capitol; 1793+	Washington DC		BLDG	NHL
Washington Monument 1848-85	Washington DC	106 A	BLDG	NPS
White House; 1800	Washington DC	18 A	BLDG	NPS
Wilson (Woodrow) House 1915	Washington DC		BLDG	NHL
Ft. Washington; 1809 1814-24	Washington DC vicinity	341 A	SITE	NPS
Harpers Ferry National Historical Park 1733;1859	West Virginia Harpers Ferry	518 A	SITE	NPS
Fairfax Stone Historical Monument		4 A		SHM
Morgan-Morgan Historical Monument		1 A		SHM
Rumsey Memorial Historical Monument		2 A		SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Catoctin Mountain Park	Md.	5746 A	bio	National Capitol Parks
Chesapeake & Ohio Canal National Monument & Park	Md.	4475	bio,geo wild	Nat. Monum.

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Cunningham Falls State Park	Md.	4447 A	bio	SP
Gambrill State Park	Md.	1138 A	bio	SP
Harper's Ferry National Historical Park	Md.	770 A	geo	NPS
Pen Mar State Park	Md.	77 A	bio	SP
Senaca Creek State Park	Md.	340 A	bio,geo	SP
Sugar Loaf Mountain	Md.	3850 A	bio	POT
Wills Mountain	Md.	400 A	bio	POT
Martin Hill State Forest Monument	Pa.	9 A	bio	SF
George Washington National Forest	Va.	903748 A	bio	NFS
Great Falls	Va.	780 A	bio,geo	POT
Shenandoah National Park		193178 A	bio,wild	NPS
Smoot Farm		1000 A	bio	POT
Blackwater Falls State Park	W.Va.	1679 A	bio,geo	SP
Cacapon State Park	W.Va.	5814 A	bio	SP
George Washington National Forest	W.Va	98259 A	bio	NFS
Lost River State Park	W.Va.	3610 A	bio	SP

Additional Sites identified by the Pennsylvania Department of Forests and Waters

SITE	LOCATION (COUNTY)	FEATURE
Shale Barrens	Fulton	bio
Sand Springs Bog	Adams	bio

Additional sites identified by the Virginia Commission of Outdoor Recreation

SITE	LOCATION (COUNTY)	FEATURE
Natural Chimneys	Augusta	geological
Ramsey Draft	Augusta	natural area (1794 acres) for scientific study, US Forest Service
Little River	Augusta	Backwoods Management Unit, U.S. Forest Service
Wildcat Mountain	Fairfax & Fauquier	eastern deciduous forest (630 A)
Great Falls Area	Fairfax	Great Falls of the Potomac River
Mason Neck Area	Fairfax	biological
Kellys Ford Rapids	Fauquier & Culpeper	rapids
Cedar Creek Waterfalls	Frederick	rocky ravine with high cliffs and caves
Lucas Woods	Frederick	
Devil's Backbone	Highland	rock formations
Laurel Fork	Highland	Backwoods Management Unit, U.S. Forest Service
Balls Bluff	Loudoun	
Furnace Mountain	Loudoun	wooded mountainside abutting Catoctin Creek
Little Laurel Run	Rockingham	U.S. Forest Service Natural Area
Massanutten	Rockingham	Backwoods Management Unit, U.S. Forest Service

BASIN 20

Nearly three-fourths of this basin is Undulating Land, about one-fourth is Rolling Hills and a very small amount is of Mountains and Steep Hills. Farm (24%) and Farm-Forest(71%) comprise most of the pattern in this basin. A very small amount of Forest-Wildland is also in the area. The combined quality evaluation is three-quarters of the basin medial and one-quarter low.

Population density is 48 persons per square mile (1960 census).

Needs in the basin are the preservation of shoreline and unique natural landscapes, the protection of camposite landscapes and the development of clean water.

Virginia's Scenic Rivers, a state publication which comprises part of the Virginia Outdoor Plan 1969 provides a descriptive inventory of rivers in the state which have been recommended as worthy of preservation.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Mountains	100 sq.mi.	Farm	1400 sq.mi.
Rolling Hills	1500 sq.mi.	Farm-Forest	4400 sq.mi.
Undulating Land	4300 sq.mi.	Forest-Wildland	100 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 20

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Preserve Unique Landscape (sq.mi.)	1000			1000		
Preserve Coastline (linear mi.)	64			64		
Protect Landscape Diversity (sq.mi.)	300	300	300	300	300	300
Develop Clean Water (% of basin)	75%			75%		
LEGAL DEVICES						
Fee Simple (sq.mi.)	1150	150	150	500		
Fee Simple (linear mi.)	64			32		
Easements (sq.mi.)	150	150	150	150	150	150
Zoning and/or Tax Incentive-Subsidy (sq.mi.)				650	150	150
Zoning and/or Tax Incentive-Subsidy (linear mi.)				32		
OTHER DEVICES						
Waste Treatment	x			x		
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x	x	x	x	x	x
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	207.5	40.5	40.5	102.0	18.0	18.0
Annual Cost*				1.2	0.5	0.5

* See Footnote for Basin 2

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Virginia			
Melcher's (Gari) Home, Belmont, early 1900's	Falmouth		BLDG	NHL
Monroe Law Office; 1758	Fredericksburg		BLDG	NHL
Rising Sun Tavern; 1760	Fredericksburg		BLDG	NHL
Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park;1862-4	Fredericksburg vicinity	3672 A	SITE	NPS
George Washington Birthplace National Monument; c. 1726	Fredericksburg vicinity	394 A	BLDG	NPS
Fort Monroe; 1819-34	Hampton		BLDG	NHL
Christ Church; 1732	Kilmarnock vicinity		BLDG	NHL
Lee (Thomas) Plantation Stratford Hall; 1725-30	Lerty vicinity		BLDG	NHL
Madison (James) House Montpelier; c. 1760	Orange vicinity		BLDG	NHL
Taylor (John) Plantation, Mount Airy; 1758-62	Warsaw vicinity		BLDG	NHL
Brandy Station Battlefield		500 A		

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Smith Point	Va.	100 A	bio	POT

Additional sites identified by the Virginia Commission of Outdoor Recreation.

SITE	LOCATION (COUNTY)	FEATURE
Poropotank Area	Gloucester	marshland
Rice's Fossil Area	Hampton (city)	source of fossils
North Point Nature Preserve	Mathews	natural beach along Chesapeake Bay
Dragon Run and Swamp	Middle Neck area	remote natural area
Bluff Point	Northumberland	habitat for rare species
Alexander Burger Memorial Sanctuary	Spottsylvania	

BASIN 21

26% of this basin is composed of Mountains, 36% of Rolling Hills and the remainder is 26% Undulating Land and 12% Steep Hills. About half of the landscape pattern is Farm-Forest and another 38% is in Forest-Wildland. Farms and urban areas cover 4 and 9 percent respectively. Two-thirds of the area is ranked as of medial quality, one-third is low quality.

Population density is 144 persons per square mile (1960 census).

A clustering of historic sites occurs at Richmond. The high concentration of historic sites and the range of landscapes provides a fairly diverse landscape. Needs include the preservation of 80 miles of shoreline and 80 square miles of unique landscape, and the development of clean water and urban amenities.

Virginia's Scenic Rivers, part of the Virginia Outdoor Plan 1969 provides a descriptive inventory of rivers in Virginia which have been recommended as worthy of preservation.

LANDSCAPE INVENTORY

SERIES	AREA	UNITS	AREA
Mountains	2700 sq.mi.	City	900 sq.mi.
Steep Hills	1200 sq.mi.	Farm	400 sq.mi.
Rolling Hills	3800 sq.mi.	Farm-Forest	5100 sq.mi.
Undulating Land	2700 sq.mi.	Forest-Wildland	4000 sq.mi.

NEEDS, DEVICES AND COSTS - BASIN 21

	Environmental Quality			National Efficiency		
	1980	2000	2020	1980	2000	2020
NEEDS						
Preserve Unique Landscape (sq.mi.)	80			80		
Preserve Coastline (linear mi.)	80			80		
Develop Clean Water (% of basin)	10%			10%		
Develop Metropolitan Amenities (sq.mi.)	11			11		
LEGAL DEVICES						
Fee Simple (sq.mi.)	91			51		
Fee Simple (linear mi.)	80			40		
Zoning (sq.mi.)					40	
Zoning (linear mi.)				40		
OTHER DEVICES						
Impoundment	x			x		
Waste Treatment	x			x		
Recreation Facility	x	x	x	x	x	x
Wildlife Facility	x	x	x	x	x	x
Preventive Flood Plain Management	x			x		
Watershed Mgmt., Agricultural Practices	x	x	x	x	x	x
Watershed Mgmt., Reforestation	x	x	x	x	x	x
COST IN $ MILLION						
First Cost	29.5			14.5		

HISTORIC AREAS

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
	Virginia			
Appomattox Court House National Historic Park; 1865	Appomattox vicinity	972 A	SITE	NPS
Henry (Patrick) House, Scotchtown; 1719	Ashland vicinity		BLDG	NHL
Allen (Arthur) House, Bacon's Castle; 1655	Bacon's Castle		BLDG	NHL
Byrd (William II) Plantation, Westover; 1730-4	Charles City vicinity		BLDG	NHL
Tylor (John) House, Sherwood Forest; 1842-62	Charles City vicinity		BLDG	NHL
Rotunda, University of Virginia; 1822-6;1898	Charlottsville		BLDG	NHL
Jefferson (Thomas) Plantation, Monticello;1770-89	Charlottesville vicinity		BLDG	NHL
Jamestown National Historic Site; 1607	Jamestown	21 A	SITE	NPS
Colonial National Historical Park; 17,18 century	Jamestown & vicinity	9430 A	DIST	NPS
Barracks, Virginia Military Institute;mid 19 century	Lexington		BLDG	NHL
Lee Chapel, Washington & Lee University;c.1866	Lexington		BLDG	NHL
Five Forks Battlefield 1865	Petersburg vicinity		SITE	NHL
Petersburg National Battlefield;1864-5	Petersburg vicinity	2731 A	SITE	NPS
Marshall House; 1790	Richmond		BLDG	NHL

HISTORIC AREAS (con't.)

SITE AND DATE	LOCATION	AREA	TYPE	CLASS
St. John's Episcopal Church; 1740-1	Richmond		BLDG	NHL
Virginia State Capitol 1785-92	Richmond		BLDG	NHL
White House of the R Confederacy; 1818	Richmond		BLDG	NHL
Richmond National Battlefield Park; 1862-5	Richmond vicinity	747 A	SITE	NPS
Ruffin (Edmund) Plantation Marlbourne; 1843	Richmond vicinity		BLDG	NHL
Cape Henry Lighthouse;1792	Virginia Beach		BLDG	NHL
Thoroughgood (Adam) House, c. 1636-40	Virginia Beach		BLDG	NHL
Williamsburg Historic District; 1633	Williamsburg		DIST	NHL
Wren Building, College of William & Mary;1702	Williamsburg		BLDG	NHL
Washington's Grist Mill		7 A		SHM

NATURAL AREAS

SITE	LOCATION	AREA	FEATURE	CLASS
Back Bay Migratory Waterfowl National Wildlife Refuge	Va.	4589 A	bio	NFW
Dismal Swamp	Va.	100000 A	bio,wild	POT
Goshen Natural Area	Va.	2000 A	bio,wild	SNA

NATURAL AREAS (con't.)

SITE	LOCATION	AREA	FEATURE	CLASS
Hog Island Refuge	Va.	1900 A	bio	SNA
Presquile National Wildlife Refuge	Va.	1329 A	bio	NFW
Seashore State Park	Va.	2770	bio,geo wild	SP
Seashore Natural Area				NL

Additional sites identified by the Virginia Commission of Outdoor Recreation.

SITE	LOCATION (COUNTY)	FEATURE
Fernbrook Natural Area	Albemarle	high bluffs overlooking Rivanna River. Includes 62 acres of second growth forest and some 300 year old beech
Brushy Mountain Area	Allegheny	rugged; large timber
Dolly Anne Hollow	Allegheny (Warm Springs area)	managed by US Forest Service as a Scenic Area. Includes some virgin timber.
Falling Spring Falls	Allegheny	high waterfalls
St. Mary's River	Augusta	scenic river with double waterfalls. Managed by US Forest Service as a Backwoods Management Unit.
Back Creek Gorge	Bath	whitewater rapids

Sinking Creek	Bath	largest cave system in Virginia
Rich Hole	Bath, Allegheny Rockbridge	Backwoods Management Unit, US Forest Service
Lower Chickahominy	Charles City James City	cliffs forming a high plateau
Bullpasture River Gorge	Highland	river gorge
Crabtree Falls	Nelson	managed as Scenic Area by US Forest Service
Chickahominy Swamp	New Kent, Charles City, James City	river bordered by marshes with fine cypress stands
Natural Bridge	Rockbridge	
Goshen Pass Natural Area	Rockbridge	

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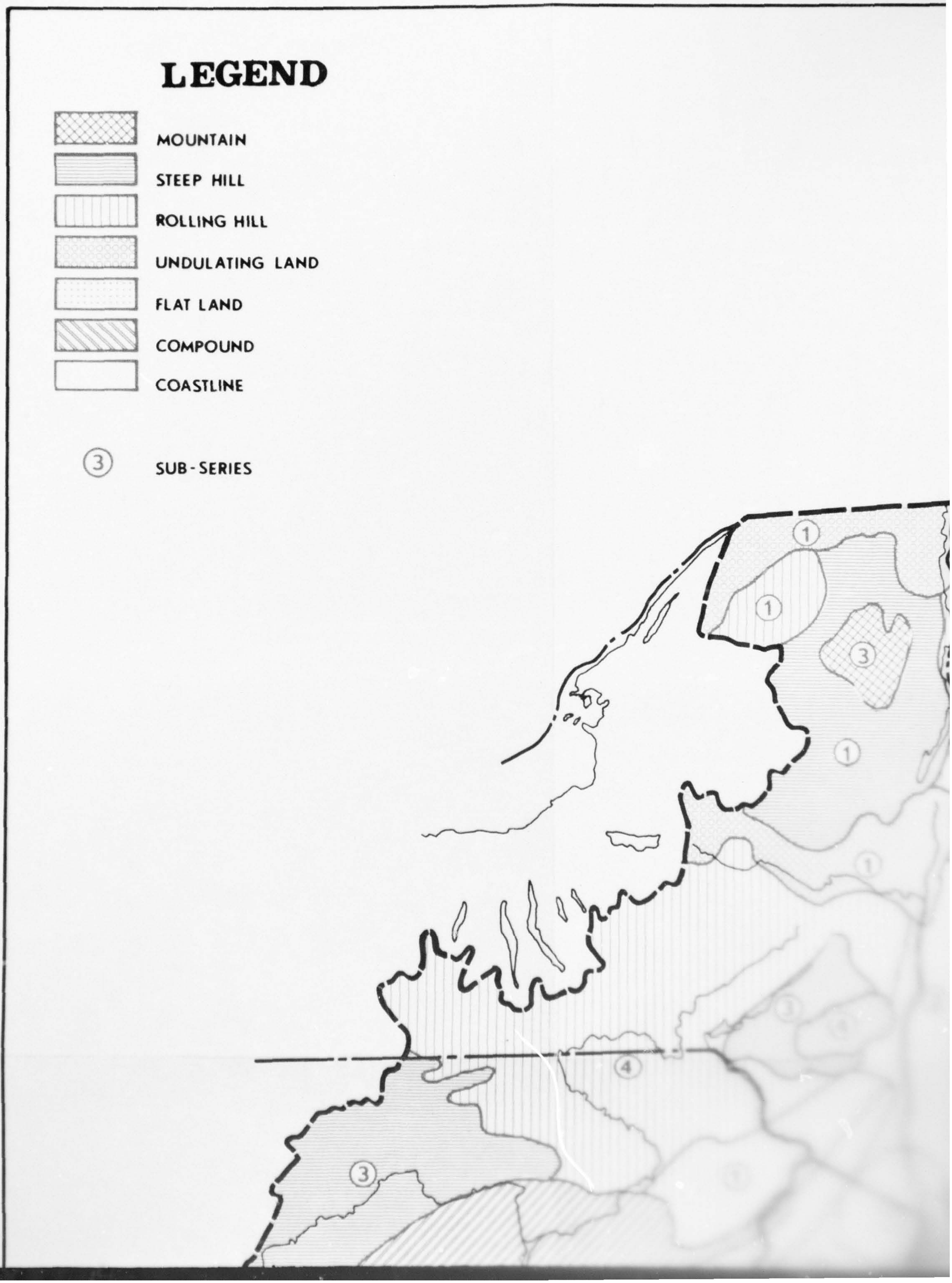
LEGEND
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FLAT LAND
COMPOUND
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NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY. APPENDIX N. VISU--ETC(U)
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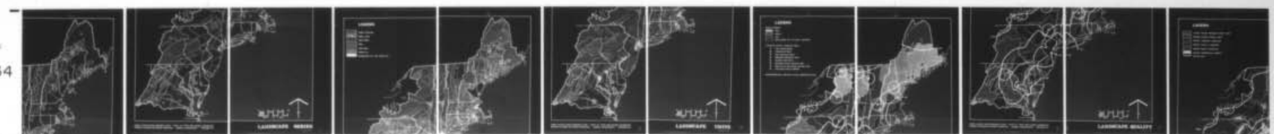

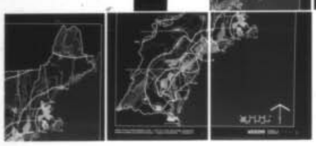

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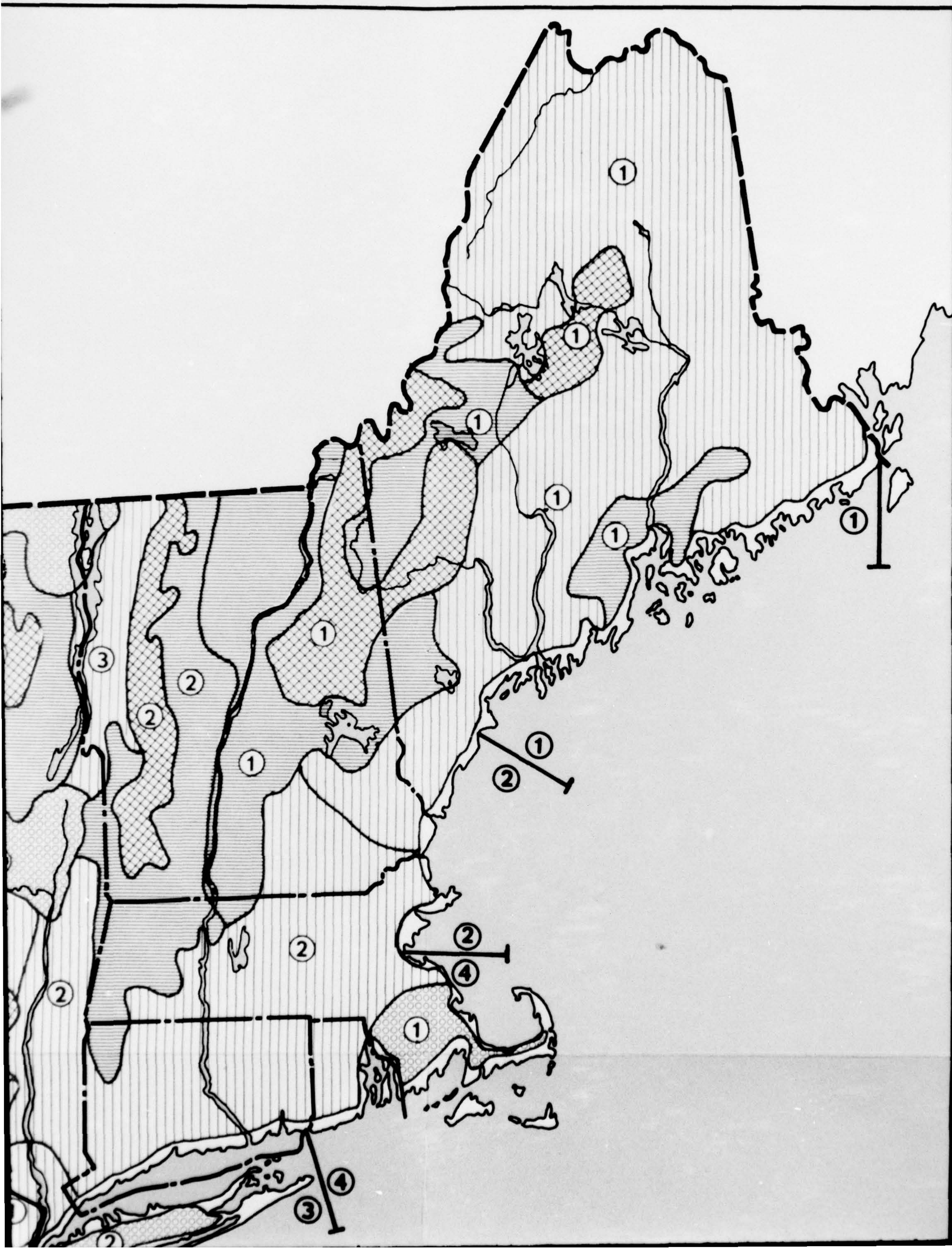

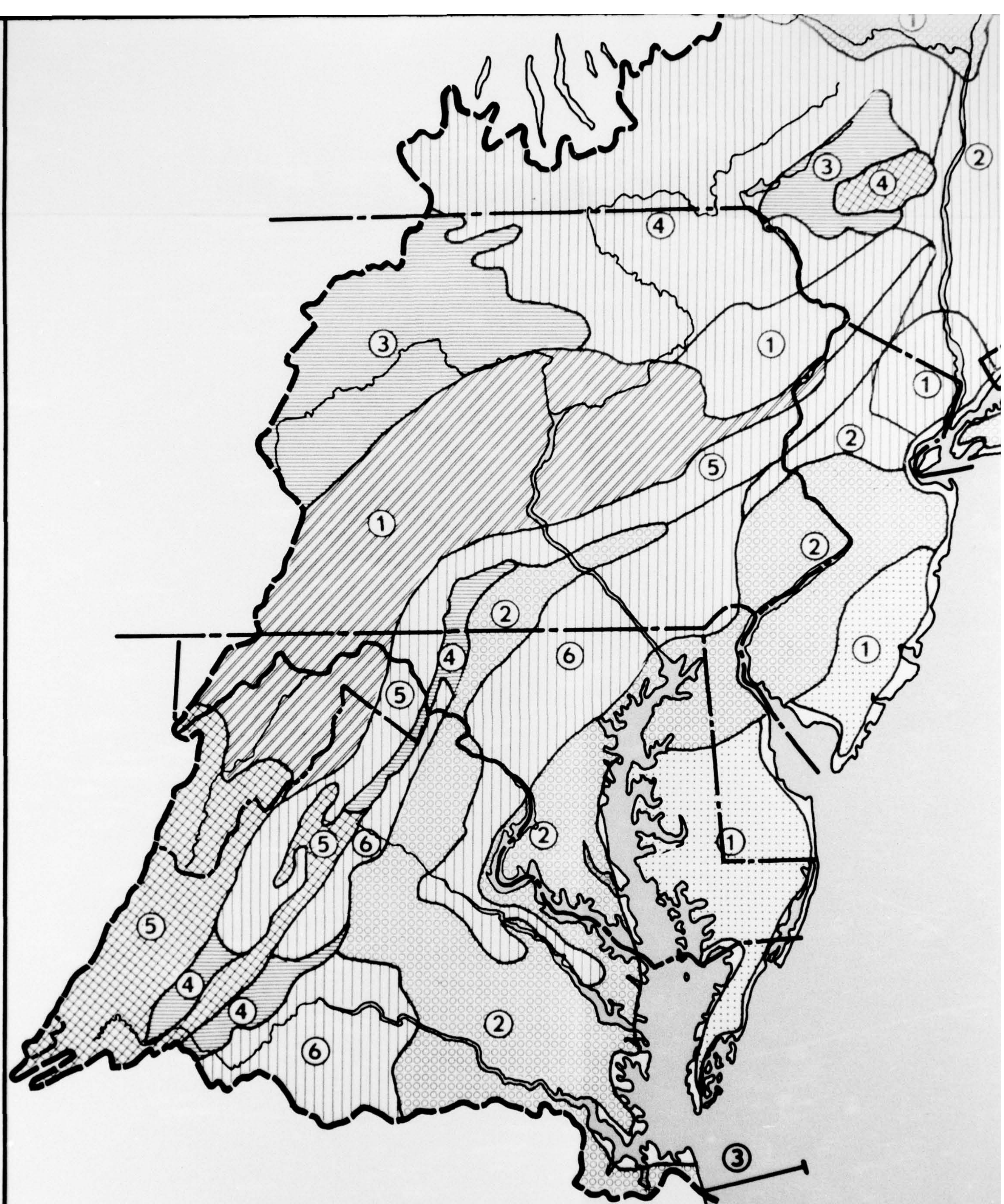

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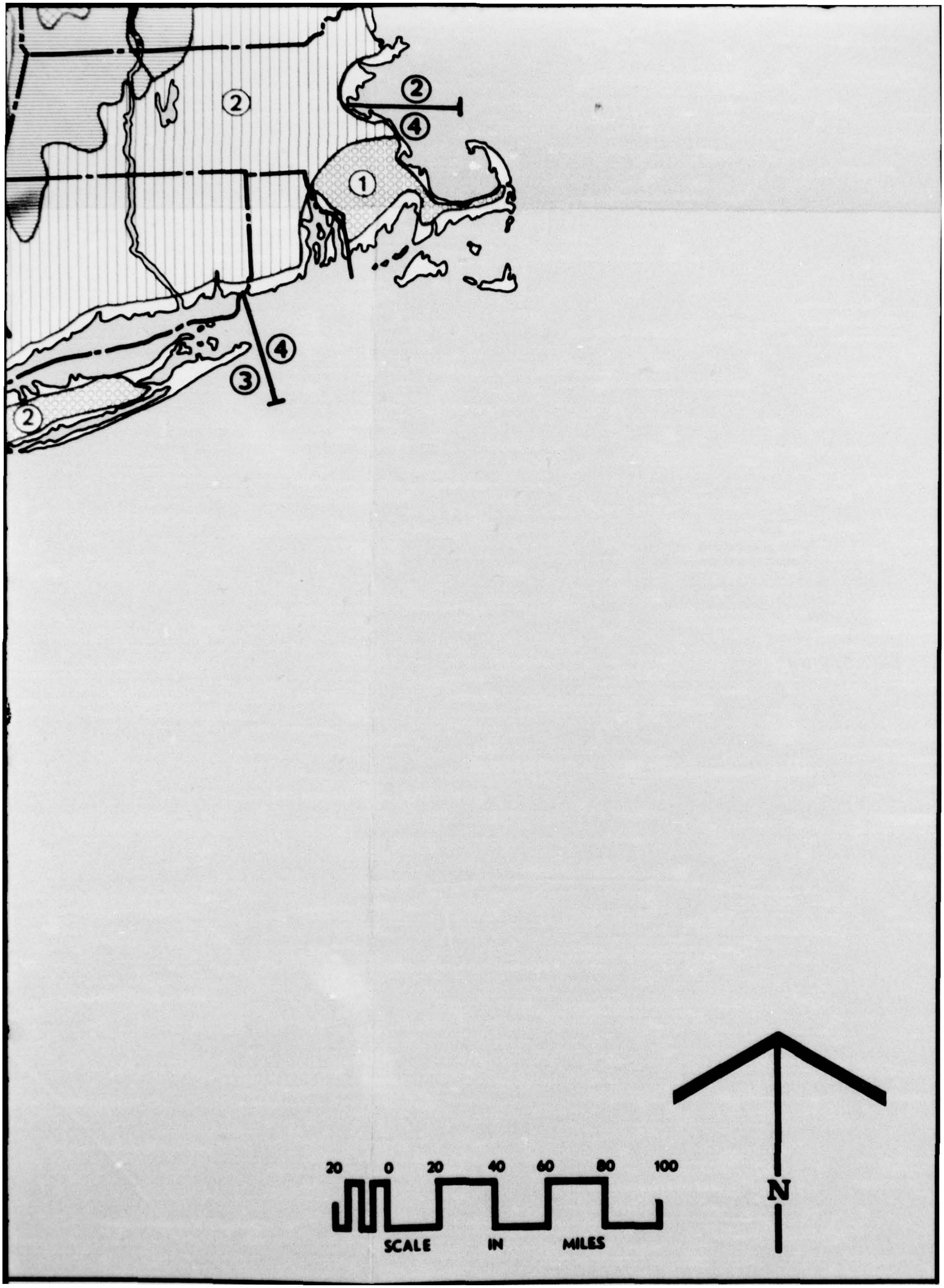

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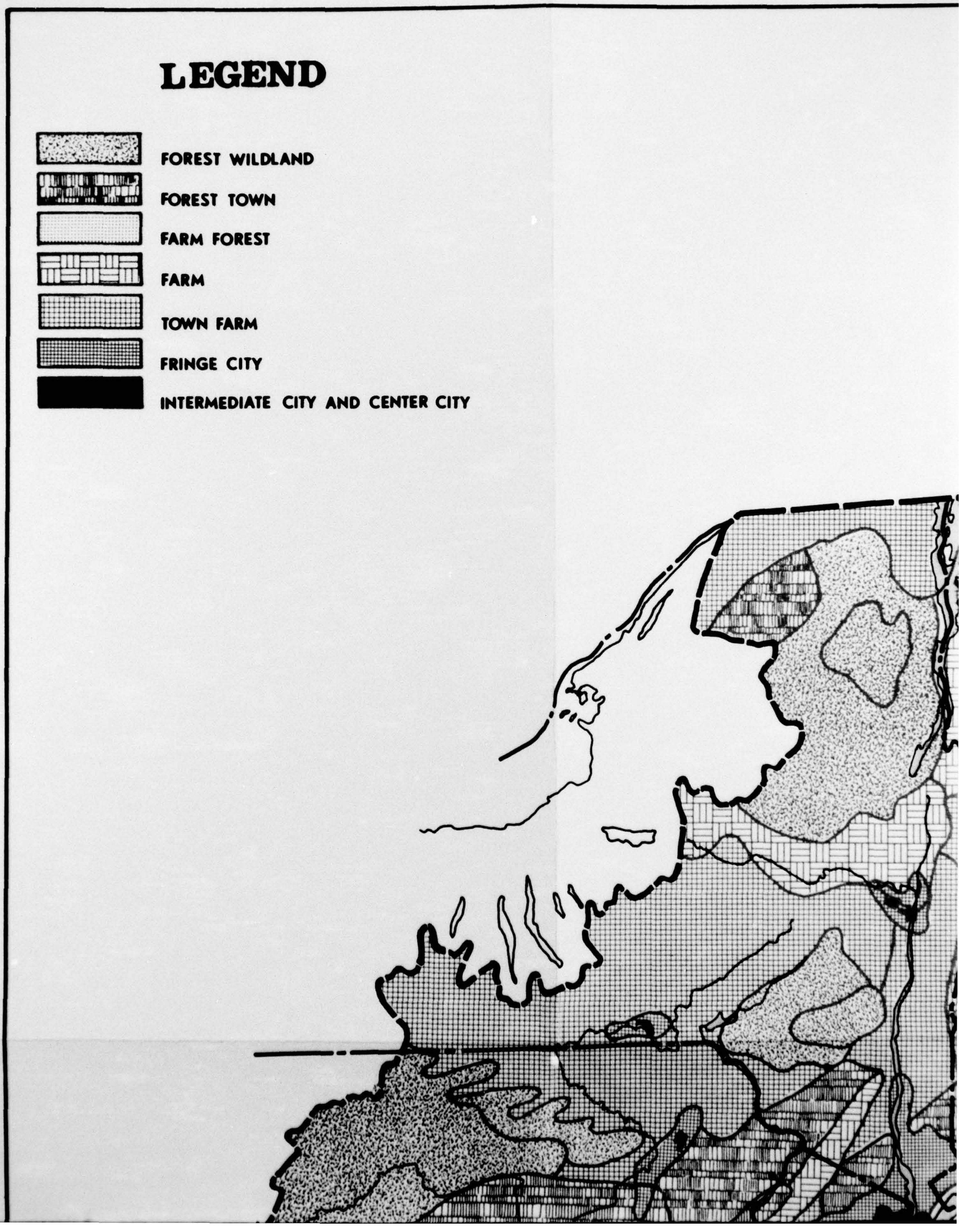
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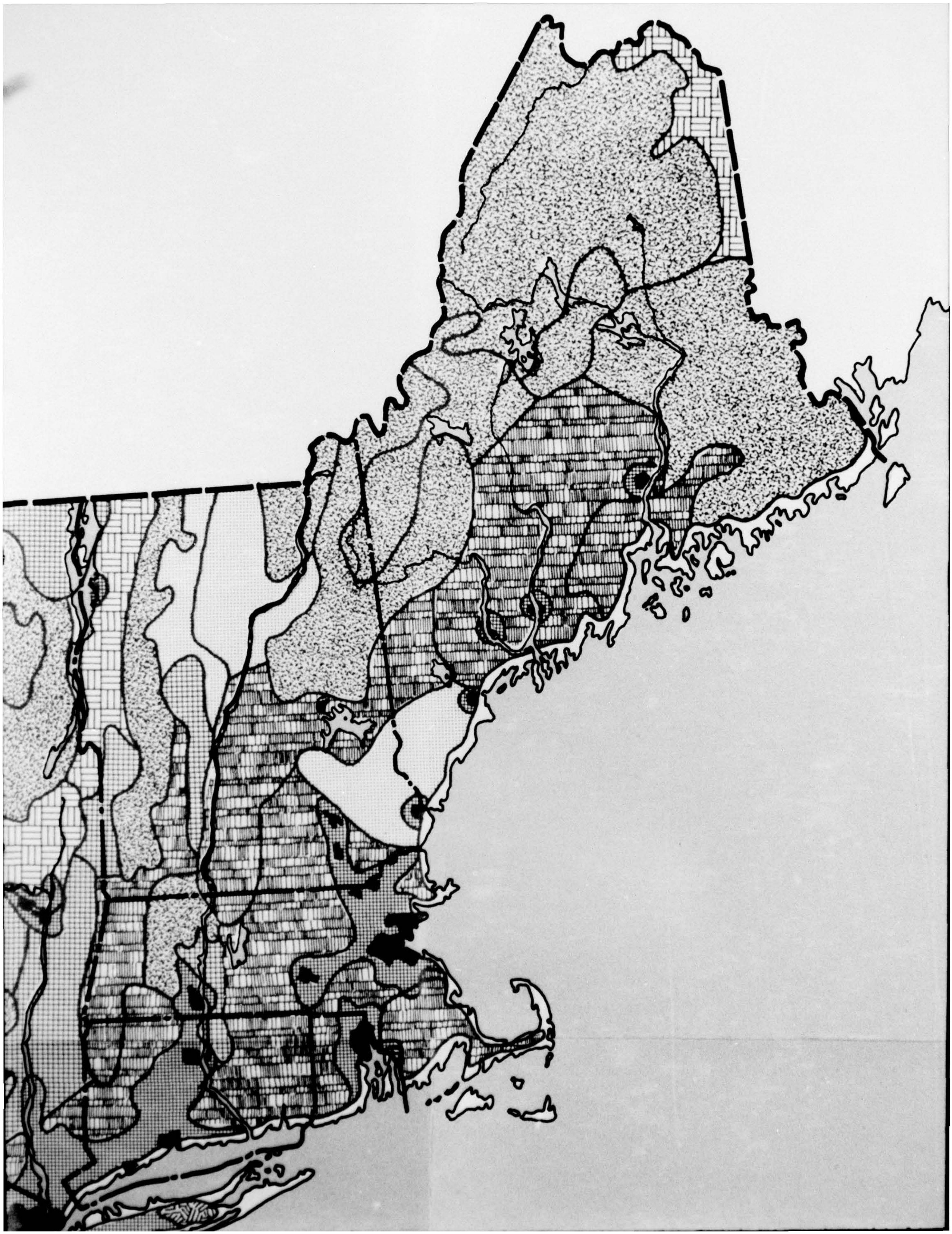
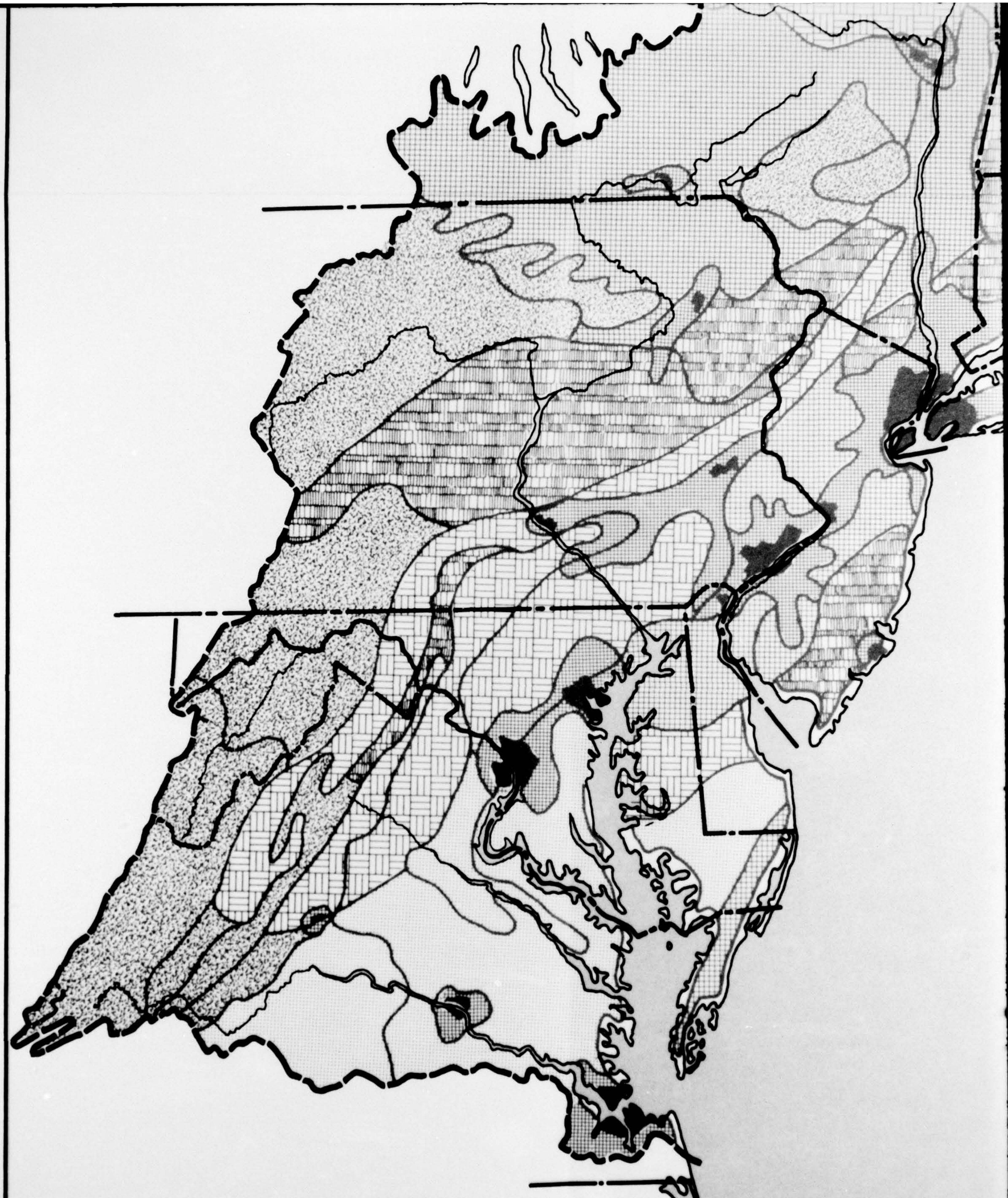
FOREST TOWN
FARM FOREST
FARM
TOWN FARM
FRINGE CITY
INTERMEDIATE CITY AND CENTER CITY





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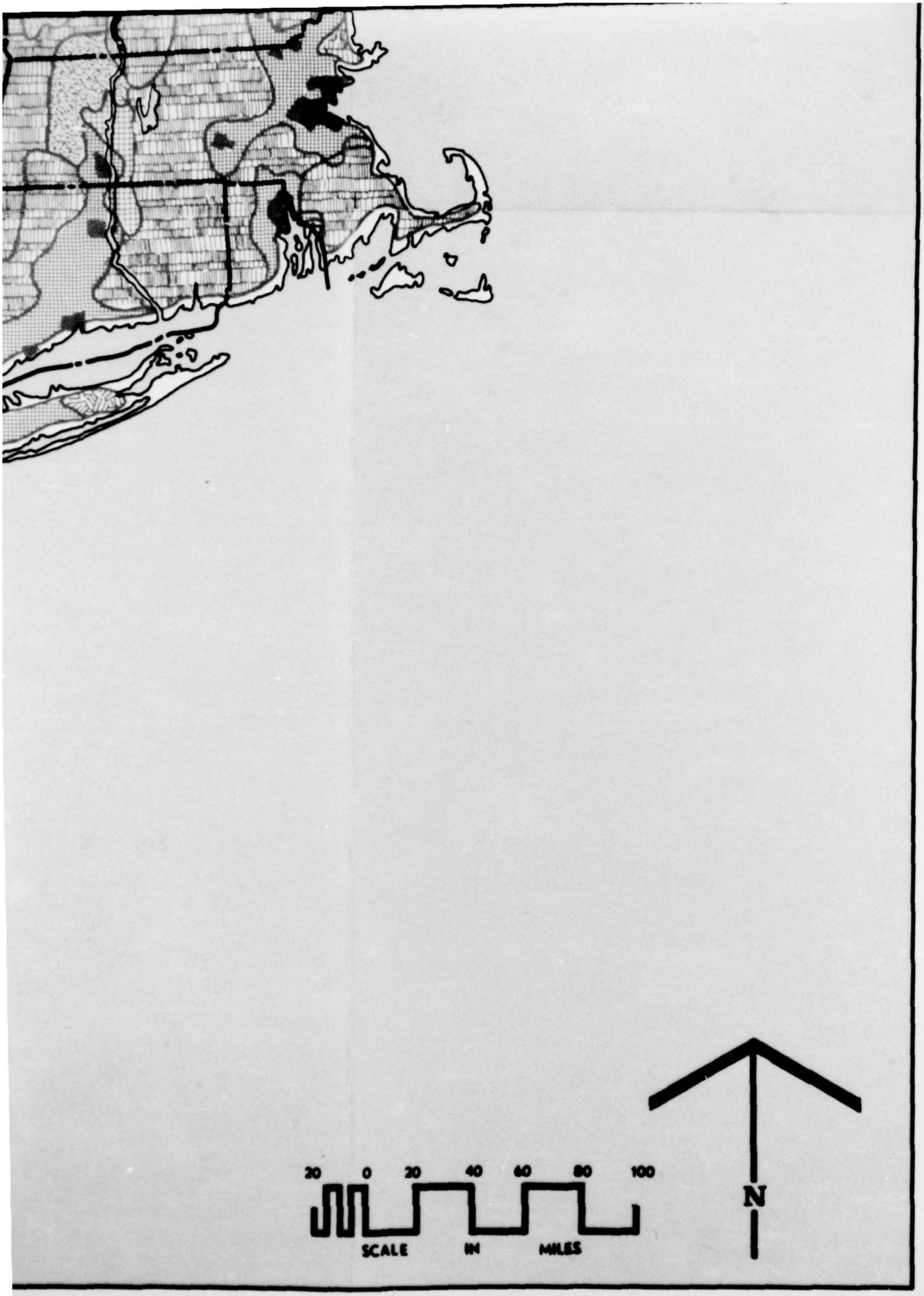
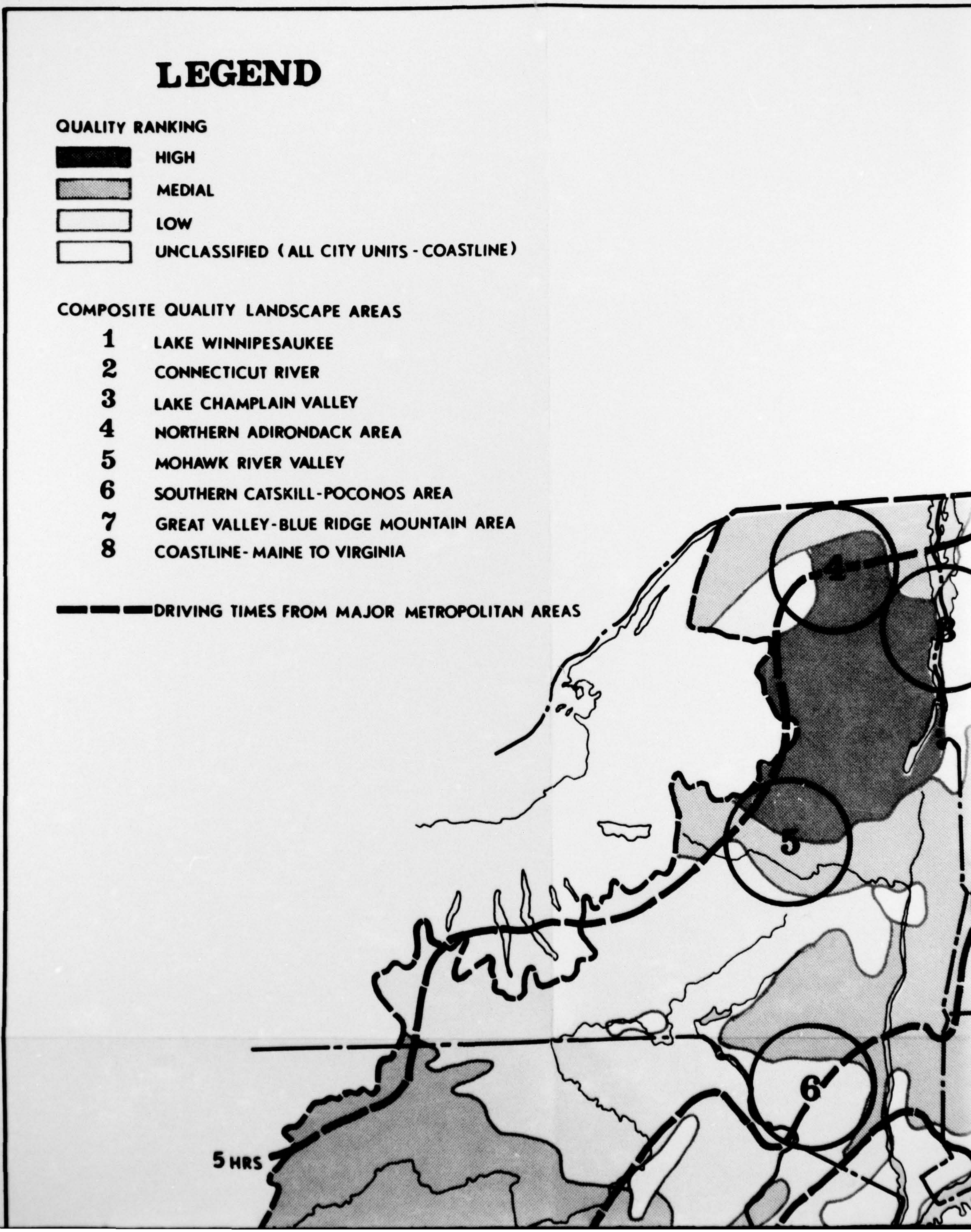


LANDSCAPE UNITS

4

FIGURE N-37


LEGEND
QUALITY RANKING
HIGH
MEDIAL
LOW
UNCLASSIFIED (ALL CITY UNITS - COASTLINE)
COMPOSITE QUALITY LANDSCAPE AREAS
1 LAKE WINNIPESAUKEE
2 CONNECTICUT RIVER
3 LAKE CHAMPLAIN VALLEY
4 NORTHERN ADIRONDACK AREA
5 MOHAWK RIVER VALLEY
6 SOUTHERN CATSKILL-POCONOS AREA
7 GREAT VALLEY-BLUE RIDGE MOUNTAIN AREA
8 COASTLINE- MAINE TO VIRGINIA
DRIVING TIMES FROM MAJOR METROPOLITAN AREAS
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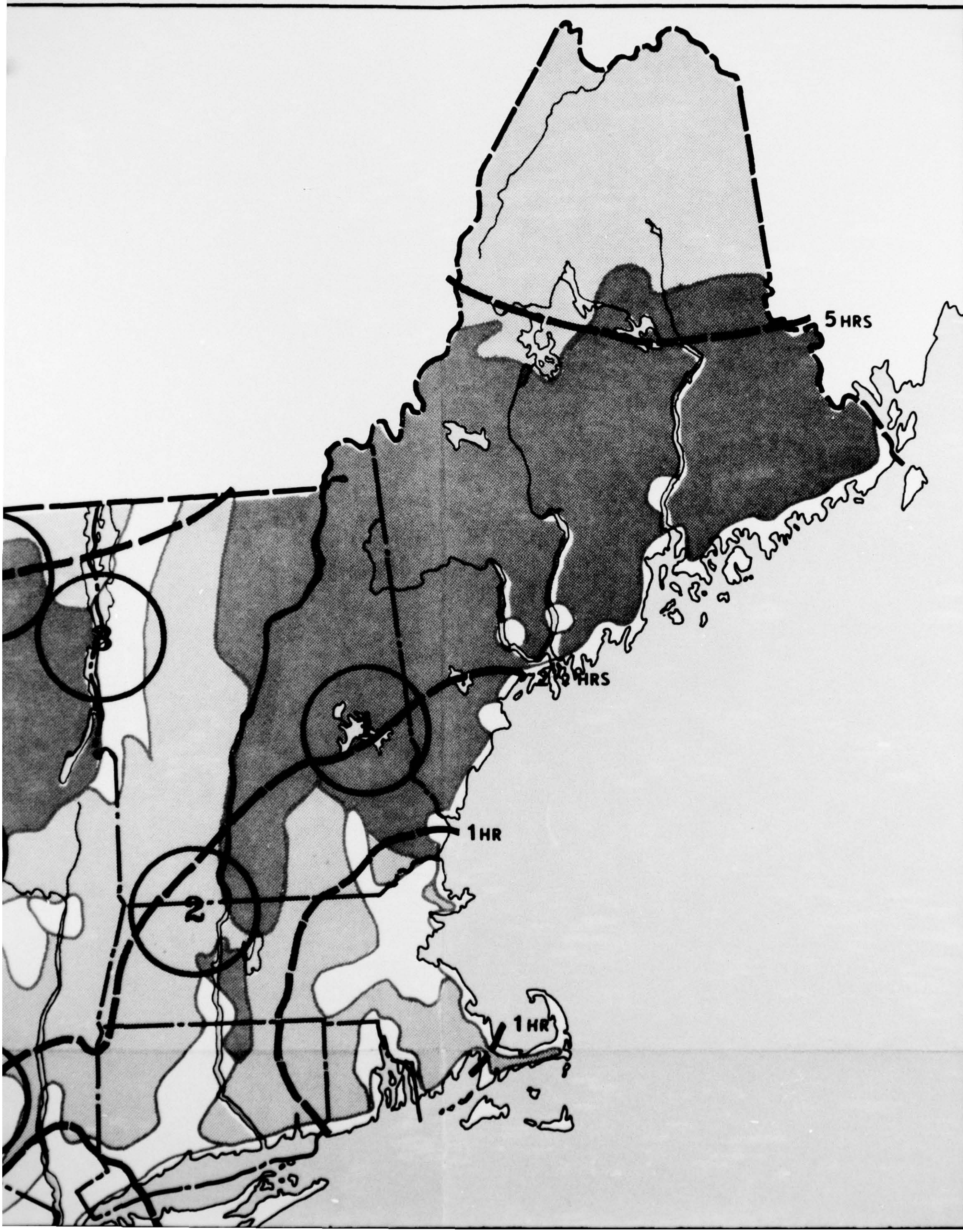

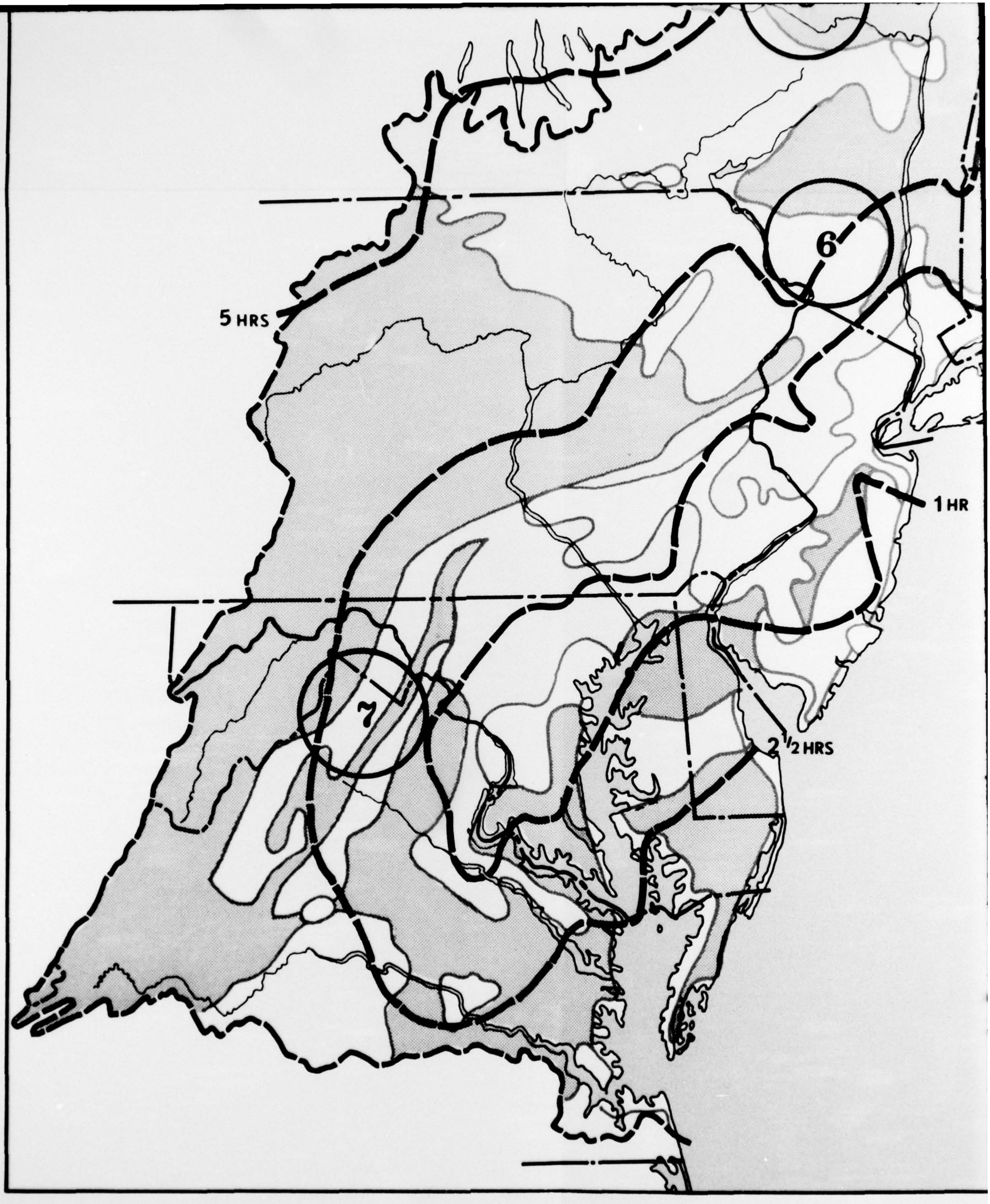
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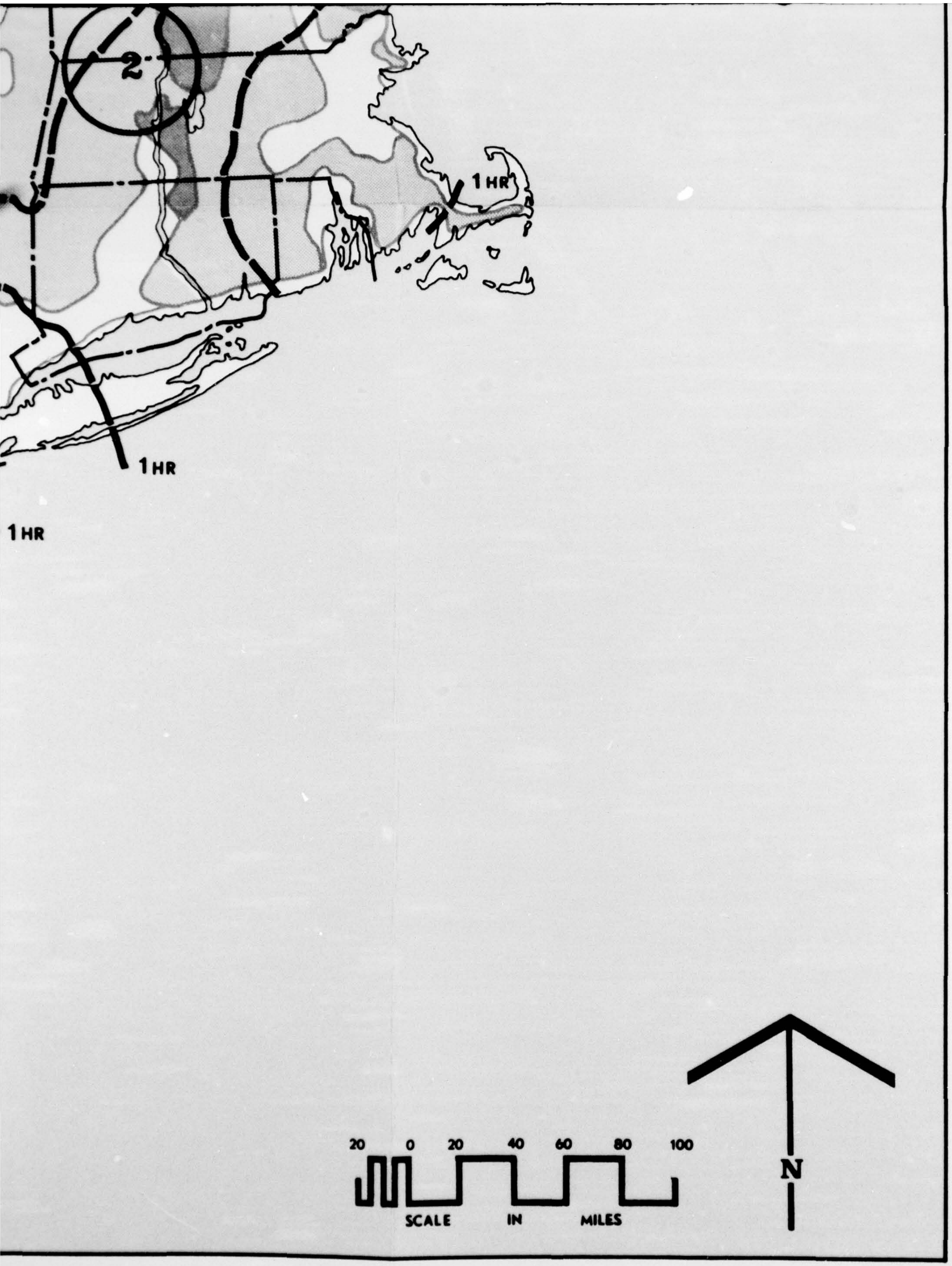
2 1/2 HRS



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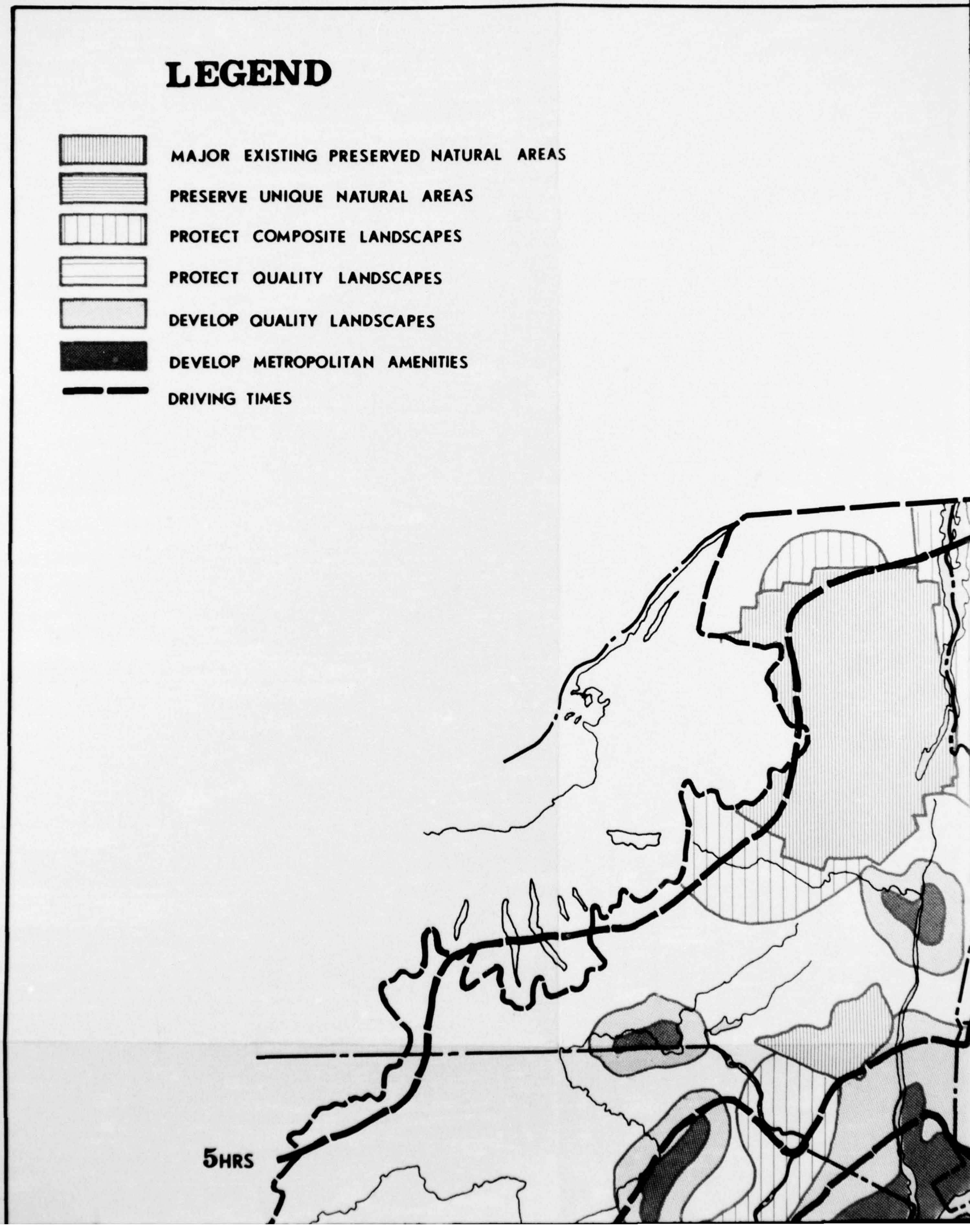
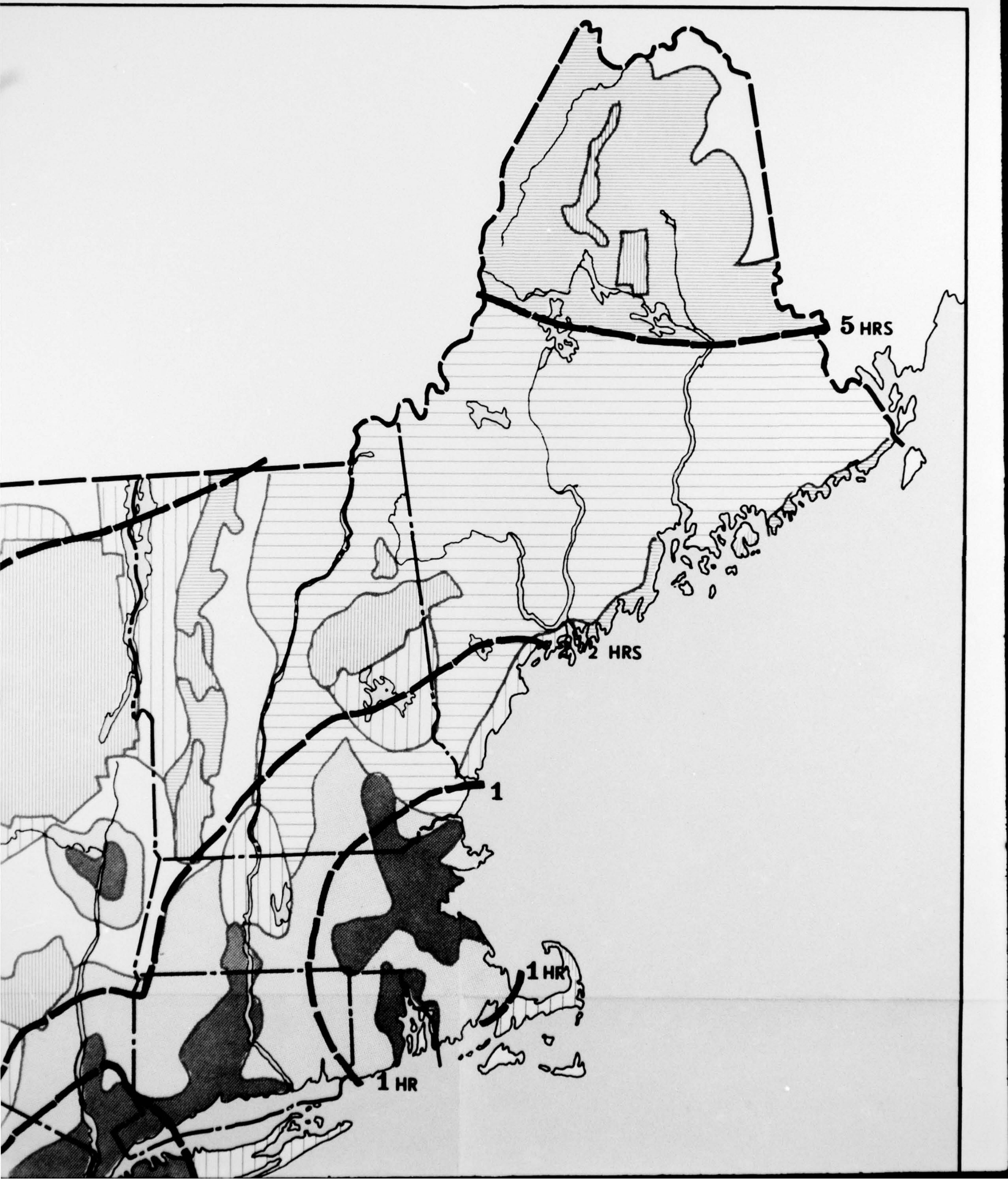
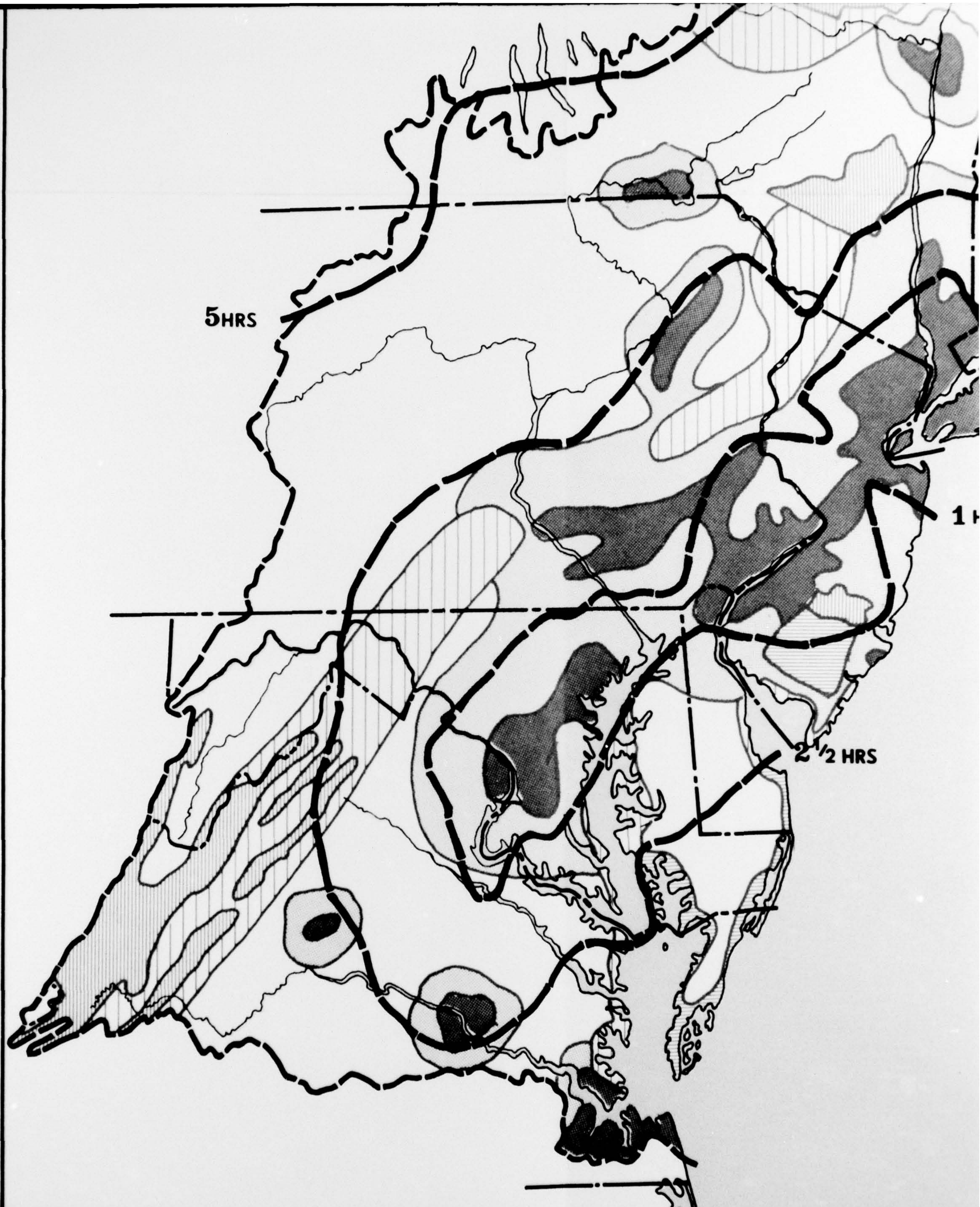
LANDSCAPE QUALITY

4

FIGURE N-38


LEGEND
MAJOR EXISTING PRESERVED NATURAL AREAS
PRESERVE UNIQUE NATURAL AREAS
PROTECT COMPOSITE LANDSCAPES
PROTECT QUALITY LANDSCAPES
DEVELOP QUALITY LANDSCAPES
DEVELOP METROPOLITAN AMENITIES
DRIVING TIMES
5HRS


5 HRS
2 HRS
1
1 HR
1 HR



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NEEDS PLANNING & MANAGEMENT FIGURE N-39